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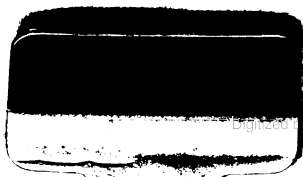
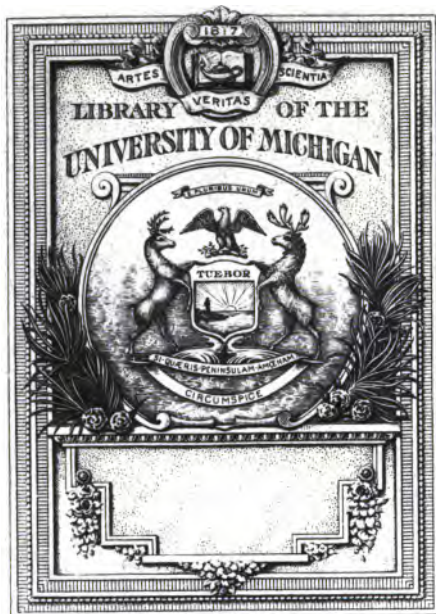
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THE PRICE OF MILK

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THE PRICE OF MILK

THE PRICE OF MILK

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WITH
MAPS, CHARTS AND DIAGRAMS



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**THIS BOOK
IS
DEDICATED TO**

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W. S. WISE
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Milk Producers

**HENRY WOOLMAN
E. M. BAILEY
JOHN LEFEBRE**
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This book is the outgrowth of the studies incident to the author's duties as chairman of the Governors' Tri-State Milk Commission (Pennsylvania, Maryland and Delaware), as Federal Milk Commissioner for the Eastern States in the Food Administration and as price mediator in monthly milk price conferences, particularly in the Philadelphia, Pittsburgh and Baltimore Districts. In these conferences the interests of those who sell and those who buy and those who consume milk have found expression in price. Prices therein agreed to have had far-reaching consequences to the welfare of many thousands of producers and several million consumers and to the business security of many milk distributors and manufacturers. Errors in price judgment quickly revealed themselves and returned to plague their authors at the next conference.

It is difficult to choose the names that should have special mention because of aid given the author in the preparation of the manuscript. Among these are Frank P. Willits, Robert Balderston, H. D. Allebach, Fredrick Shangle, A. W. Place, W. S. Wise, T. S. Brennehan, D. G. Harry, and I. W. Heaps, milk producers; E. M. Bailey, Henry Woolman, Harry Scott, Thomas Harbison, Henry Dolfinger, C. R. Lindback, Asa B. Gardiner, C. R. Bowman, J. D. Stark, Irvin D. Baxter, milk dealers; Mrs. Nevada D. Hitchcock, Mrs. H. C. Boden, Mrs. Joseph

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The price of no other commodity represents so much for good or ill to public and individual welfare as does the price for milk. The author sends this book out with the hope that it may here and there be helpful in a modest way to mutual understanding and coöperative effort in keeping wholesome all the factors that make for a fair milk price.

PART I

The Price of Milk to the Producer

CHAPTER I

The Public Interest in the Price of Milk

Milk is the essential element in the diet of civilized peoples.

It is estimated that during the year 1917 the American people drank 36,500,000,000¹ pounds, or 18,250,000 tons, or 2,000,000 carloads of whole milk. This was 43.1 per cent of the 84,611,350,000 pounds produced in the United States in that year. In round numbers the forty-five millions of our people who dwell in cities drank approximately 31,500,000 pounds daily, in comparison with 45,000,000 pounds consumed each day by the thirty million persons who live on farms having dairy cows and 25,000,000 pounds consumed by the twenty-five millions who live in small towns or on farms without dairy cows. This is an average daily consumption of two-thirds of a pint by persons who dwell in cities. The average consumption of those who live on farms having dairy cattle is one and one-half pints per day, and of those who live in small towns or on farms without dairy cows one pint per day.

Vast as this consumption is, it is not as large in many families as dietitians say it should be for wholesome nutrition. To give to all the one pint per day,

¹ This is the estimate given by the United States Department of Agriculture in Circular No. 85, issued January 31, 1918, p. 15.

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which Professor H. C. Sherman has said is the minimum necessary to maintain health, the residents of our cities would have to consume one-third more milk than they do now. Expansion far beyond this would be necessary to meet the standard of a quart a day which Professor Sherman says is a good rule to remember. Professor Graham Lusk writes: "No family of five should buy meat until they have bought at least three quarts of milk." If such are to become our consumption standards, our production will have to be greatly increased.

Professor E. V. McCollum, the outstanding nutrition expert of the day, says as to the need for our increased use of milk as a food:¹

There is no substitute for milk, and its use should be distinctly increased instead of diminished, regardless of cost. Every possible means should be employed to reduce the cost of distribution. The necessity for the liberal use of milk and its products both in the diets of children and adults should be emphasized in order to stem the ebbing tide of its production. It has been pointed out that the value of milk as a food cannot be estimated on the basis of its contents of protein and energy. Even when measured by this standard it compares most favorably with other foods, but it has a value as a protective food in improving the quality of the diet, which can be estimated only in terms of health and efficiency.

An examination of any large groups of people in the cities, will show that where there is a high mortality from tuberculosis, milk is not being

¹ McCollum, "The Newer Knowledge of Nutrition". MacMillan, 1919, pp. 152 and 153.

PUBLIC INTEREST IN THE PRICE OF MILK

used to any great extent, and in any large group where milk purchases are large this disease is not a menace. It is well known that in institutions where tuberculosis is successfully treated milk forms the principal article of the diet of the inmates. This has resulted from clinical experience. There is no other effective treatment for this disease than that of providing fresh air, insisting upon rest and heightening the body's powers of resistance through the liberal use of milk for the correction of faults the diet will inevitably have when it consists too largely of seed products, tubers, roots and meats. The importance of diets of this character in the etiology of tuberculosis, has not hitherto been appreciated. In the light of facts presented in the previous chapters of this book, there can be no reasonable doubt that the importance of poor hygienic conditions and of poor ventilation have been greatly over-estimated, and that of poor diet not at all adequately appreciated as factors in promoting the spread of this disease. Milk is just as necessary in the diet of the adult as in that of the growing child. Any diet which will not support normal development in the young will not support optimum well-being in the adult. Milk is our greatest protective food, and its use must be increased. The price must be allowed to go up as long as the cost of production makes it necessary, and up so far as is essential to make milk production a profitable business. Unless this is done, the effects will soon become apparent in a lowering of our standards of health and efficiency.

There is a substantial reason for this large consumption of milk as well as for the insistence of nutrition experts that it should be further increased.

THE PRICE OF MILK

Such national food habits do not grow up without a cause.

The reason for the consumption and for these recommendations to increase consumption can be stated in a sentence: Milk is one of the cheapest and is the most wholesome of foods because it is both a "protective" food and a food easily assimilable for use by bone and muscle. Dietitians chorus the call to use more milk because it contains certain elements that are essential to sound nutrition and to the preservation of vitality and health, in addition to its value as sources of protein and energy. In Chapter XIII essential facts as to the elements that make milk the outstanding protective food will be further discussed.

But the large consumption of milk in the United States preceded the definite discoveries of these protective food elements. In part this consumption can be attributed to an instinctive knowledge that milk-fed humans fare better than those not milk fed. Many a farmer had noted the difference between the calves or the pigs that did and those that did not get milk in their diet. And mothers knew from folk lore and from their own observations that milk was the best food for growing children.

All consumers have had before them daily proof from the market that milk was one of the cheapest of animal foods. That knowledge was not expressed as exactly as it can be now; but it was known, and is now known and roughly measured by the housewife who chooses what she buys or decides what

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food she sells. The farm wife has not known precisely that one quart of milk is equal to 4.3 eggs as a source of protein and to 8.5 eggs or a pound of lean meat as a source of energy, as scientists have found that it is; but she has long preferred milk as a food for her children, and has sold the eggs. The city housewife has not known the precise fact that milk at 16 cents a quart is as cheap a source of proteins as sirloin steak would be at 35.4 cents a pound, or as eggs would be at 45 cents a dozen. And she has likewise been scientifically ignorant of the extent to which milk is valuable because of its mineral content. Although she has, therefore, been unwilling to buy as much milk as the facts would warrant, nevertheless the total consumption of city dwellers shows that the city housewife has to an extent selected the better and cheaper food. Comparative food values have not been the sole guide with either the country or the city housewife. Ease of marketing eggs as compared with milk has helped the country wife make her decision, while the fact that her family prefers to chew solid food, regardless of its actual protein or energy content, has helped to deter the city housewife from buying solely on an exact food-worth basis.

From the viewpoint of natural welfare it is of serious importance that our city earners buy foods which will yield them their full money's worth. The days of national isolation were numbered with the incoming of rapid steam transportation, and they passed when the cable and the wireless made it

THE PRICE OF MILK

possible for nations to compete in prices for the output of their factories as well as for the products of the farms, the seas and the mines. Our high standards of living can be kept up without fear of ruinous competition in international trade only if we choose for our diet those foods that give the best nutrition for the least price. Among such foods dairy products easily take first place. The dairy cow is an economical producer of animal food. For turning inedible into edible human foods the dairy cow acknowledges the farm pig as her only near competitor, and in the long run she leisurely leads the pig. In a short race the pig beats the cow only because of the longer period necessary for the cow to mature.

The amount of edible solids produced for each 100 pounds of digestible organic matter consumed by different farm animals is as follows:¹

Animal.	Edible Solids Produced (pounds).	Animal.	Edible Solids Produced (pounds).
Cow (milk).....	18.0	Poultry (eggs).....	5.1
Pig (dressed).....	15.6	Poultry (dressed).....	4.2
Cow (cheese).....	9.4	Lamb (dressed).....	3.2
Calf (dressed).....	8.1	Steer (dressed).....	2.8
Cow (butter).....	5.4	Sheep (dressed).....	2.6

Herein lies the reason why Mr. Hoover emphasized hog production during the war period. The production of hogs can expand quickly to meet war needs without as serious consequences in the sudden contraction that may follow. Had the war been

¹ Compiled from tables of United States Department of Labor.

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prolonged, however, the policy of stimulating hog production at the expense of dairy foods would have been dangerous in the extreme. It is stated that at the beginning of the war Germany adopted the rule to conserve cereals for human consumption by killing off all cows over two years old that could not be sustained on foods and roughage unfit for human beings. Milk production soon fell off. Consequently the children soon ceased to get those elements, found so plentifully in milk, which are essential to sound nutrition. England, on the other hand, kept the largest number of cows possible and bought milk freely from the United States.

The World War has no doubt changed permanently to a degree the national and racial habits as to sources of foods. The extent of the change we cannot measure until normal conditions have been restored for a number of years. However, we have at hand a table showing certain national and racial habits for the period just previous to the war. As a general rule it may be said that foods from vegetable sources are cheaper than foods from animal sources, because of the loss of edible solids in the production of animal foods from organic matter, as given in the table on page 22. It is vital to our national well-being that our earners buy their food from sources as cheap as is consistent with contentment and wholesome food value. Yet a comparison with other nations for this pre-war period shows that we were getting a larger share of our food from the more expensive animal food sources. As a people we were, and no

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doubt still are, next to England, and excepting the new grazing countries mentioned on page 23, the heaviest consumers of animal products in the world.

The table comparing the food sources per capita of various competing nations follows:

THE FOOD SOURCES OF THE NATIONS¹

Country.	Total Protein Sources (grams).	Protein from Animal Sources (grams).	Protein from Plant Sources (grams).	Total Fat Sources (grams).	Fat from Animal Sources (grams).	Fat from Plant Sources (grams).	Carbo-hydrates.	Calories.
United States..	100	60	40	80	76	4	410	2,950
England.....	106	62	44	72	62	10	440	2,900
Germany.....	87	32	55	61	56	5	385	2,700
France.....	95	38	57	44	30	14	420	2,780
Austria.....	82	34	48	27	22	5	400	2,500
Russia.....	85	22	63	26	16	10	450	2,425
Italy.....	86	24	62	52	12	40	430	2,600
Japan.....	70	11	59	14	3	11	490	2,360

The chart opposite indicates the per capita consumption of meat for each of the leading countries in stated pre-war periods. Outside of two new grazing countries, Australia and New Zealand (with which we do not compete in manufacturing), our per capita consumption of meats is far in excess of any country with which we will compete in matters pertaining to wages and living standards.

Studies of family budgets indicate that of the total expenditure for food of a working man's family consisting of man and wife and three children, ten

¹ The figures used in this table are Ballod's figures for 1910-1914. They appear in Smaller's *Jahrbuch*, 1915. The data for Japan have been weighted to correspond to racial differences in stature and weight.

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per cent goes for milk as compared with forty per cent for meats. It has been estimated by dietitians that such families would be better off financially and physically if twenty-five per cent of the expenditure for food went for milk.

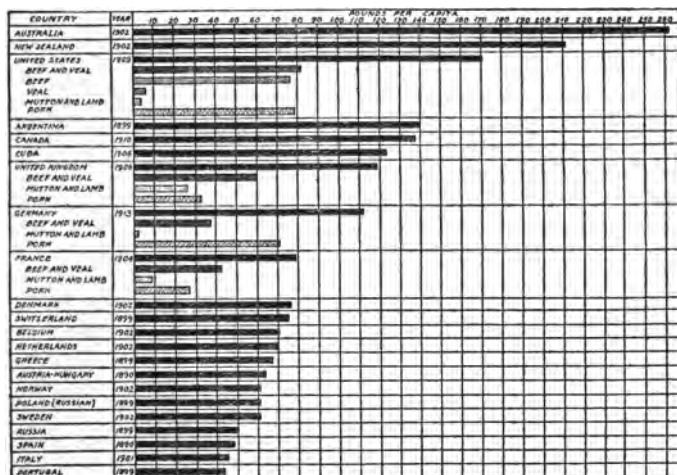


CHART NO. 1.—PER CAPITA CONSUMPTION OF MEAT IN DIFFERENT COUNTRIES¹

My argument is not that we should become vegetarians. My argument is that we should and must turn to these animal products which are the cheapest to produce and the most economical to the consumer. These are primarily dairy products. With the passing of cheap grazing lands we cannot produce

¹ From "The Meat Situation in the United States", by G. K. Holmes, United States Department of Agriculture, Report No. 109.

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meat animals as cheaply as we once did, nor as cheaply as can other countries in temperate climates where such lands are not yet exhausted. Clearly, from the standpoint of maximum utilization of our natural resources as well as from considerations of individual and family economy, the relative proportion of dairy products to other animal products used should be increased.

Had the milk produced in the United States in the year ending June 30, 1917, been utilized to the fullest extent it would have supplied one-fourth of the food needed by all of the people in our country.¹ This fact indicates the real interest of the people of this country in our dairy herds as a source of foods.

National welfare also demands attention to dairy herds because of their importance, not only as a source of food but as a source of wealth. The farm value of the 23,747,000 dairy cows estimated to be in the United States on January 1, 1919, was \$1,835,-770,000 (at \$78.20 per head as estimated by the Department of Agriculture). Prices for dairy cows were inflated during this period, but not to the degree characteristic of most commodities. The normal value under any circumstances can be regarded as well over a billion dollars. The number of dairy cows in the United States from 1867 to 1919, their value per head and their total farm value was as follows:²

¹ This is the estimate given by the United States Department of Agriculture in Circular No. 85, issued January 31, 1918.

² See Year Book, 1918, United States Department of Agriculture.

PUBLIC INTEREST IN THE PRICE OF MILK

NUMBER AND VALUE OF DAIRY COWS, U. S., 1867-1920.

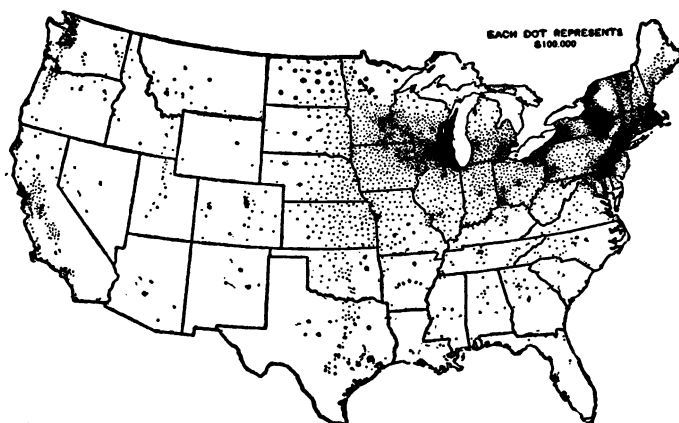
Year.	Number.	Price per Head, January 1.	Farm Value, January 1.
1867.....	8,349,000	\$28.74	\$239,947,000
1870.....	10,096,000	32.70	330,175,000
1875.....	10,907,000	25.74	280,701,000
1880.....	12,027,000	23.27	279,899,000
1885.....	13,905,000	29.70	412,903,000
1890.....	15,953,000	22.14	353,152,000
1895.....	16,505,000	21.97	362,602,000
1900.....	16,292,000	31.60	514,812,000
1905.....	17,572,000	27.44	482,272,000
1910.....	20,625,432	35.29	727,802,000
1911.....	20,823,000	39.97	832,209,000
1912.....	20,699,000	39.39	815,414,000
1913.....	20,497,000	45.02	922,783,000
1914.....	20,737,000	53.94	1,118,487,000
1915.....	21,262,000	55.33	1,176,338,000
1916.....	22,108,000	53.92	1,191,955,000
1917.....	22,894,000	59.63	1,365,251,000
1918.....	23,310,000	70.54	1,644,231,000
1919.....	23,747,000	78.20	1,835,770,000
1920.....	23,747,000	85.13	2,021,681,000

The distribution by states of the receipts from the sales of dairy products is given on the map reproduced on page 26.

Dairying, moreover, has certain economic advantages in addition to the monetary values of the annual output of the herds. The flow of milk from the herds can be so managed as to bring to the farmer a steady cash income throughout the year. The labor of the entire family can be utilized throughout the year to an extent impossible with seasonal farm products. The fertility of the soil can be kept at a level consistent with net returns from the crops. Roughage which human beings cannot eat and for which the farmer would find but a poor cash market

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can be conserved and marketed effectively through the dairy herd.



II. RECEIPTS FROM SALES OF DAIRY PRODUCTS, 1909¹

From the point of view alike of city earner and country worker, in the interests of the national well-being and of the civilization that can spring only from the well nourished, young or old, dairy products are vital.

Shall we consume, each of us, a sufficient amount of milk to create and preserve vigor and vitality? The price of milk must be such as to make this

¹From Geography of World's Agriculture, United States Department of Agriculture, 1917, p. 120: "The receipts from sale of dairy products afford a measure of the relative importance of dairying as an industry in different sections of the United States. New York leads all the States in the amount of receipts, totaling over \$75,000,000 in 1909, and probably two to three times that amount today. Wisconsin ranks second, with Pennsylvania third, while Illinois, Iowa, Ohio and Minnesota were practically equal in amount of sales of dairy products in 1909, each receiving about \$25,000,000. The total receipts in the United States amounted to nearly \$500,000,000 in 1909 and are undoubtedly well over a billion dollars today. The dots were distributed by counties, but the boundary lines of the counties are not shown on the map."

PUBLIC INTEREST IN THE PRICE OF MILK

possible. Are we to produce a supply of milk proportionate to our national resources and sufficient for our national needs? The price to the farmer must be such as to entice him to produce milk in preference to the other alternatives before him, whether on the farm or in the city.

Price is the medium through which we make our national judgments which will or will not maintain and develop our all important dairy industries, which will or will not keep us virile as citizens. Is our production keeping up with our needs? Has the price been such, not only to encourage consumption, but to increase production as well?

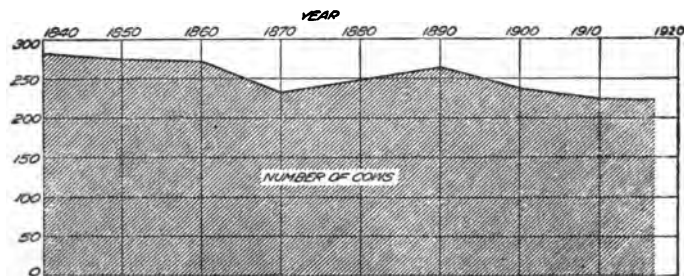


CHART NO. III.—MILK COWS IN THE UNITED STATES PER 1000 POPULATION, 1840-1918¹

The table given on page 25 indicates that the actual number of dairy cows in the United States has been increasing. The chart above indicates that, since 1890, the increase in the number of dairy cows in this country has not been in proportion to

¹ From Circular No. 85, United States Department of Agriculture, issued, January 31, 1918.

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the increase in population. This chart, however, may be deceiving as to the future to a very slight extent because the output of milk per cow is increasing through selection in certain sections of the country where dairying is a profession. Hence the total amount of milk produced is not decreasing in exact proportion to the relative decrease in the number of dairy cows. A comparison of total output with the total number of milk cows does not indicate, however, that wise selection has as yet been adopted in all sections of the country. Moreover, the question as to the output per cow is not solely one of quantity but of quality when the amount and value of feeds is considered.

The number of milk cows on the farms in the United States as of January 1st was 14.8 per cent greater in 1920 than it was for the annual average of the five-year period from 1910 to 1914, in comparison with an increase in the same year of 17 per cent in the number of other cattle, 17.8 per cent in swine, 3.3 per cent in horses, 14.9 per cent in mules, and a decrease of 6.3 per cent in the number of sheep. Dairy herds increased but one one-hundredth of one per cent in 1920 over 1919. The numbers of each are given in the table on the next page.¹

The estimated production of milk in the United States increased about 1.7 per cent from 1917 to 1918, as compared with an average annual increase in population from 1900 to 1910 of 2.1 per cent. The estimated production for 1919 increased but

¹ The Report to the President by the Secretary of Agriculture, 1918, p. 8.

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0.007 per cent over 1918. Many now believe (September, 1920) that the production for 1920 will be below what it was in 1919. In other words, the price which the farmer receives for milk is not encouraging him to enlarge his output in proportion to the increase in population.

NUMBER OF LIVE STOCK ON FARMS, 1870 TO 1918¹
(Figures are in round thousands, i. e., 000 omitted)

Kind.	1920.	1919.	1918.	1917.	1916.	1915.	1914.
Horses.....	21,100	21,482	21,563	21,210	21,159	21,195	20,962
Mules.....	4,995	4,954	4,824	4,723	4,593	4,479	4,449
Milch cows.....	23,747	23,475	23,284	22,894	22,108	21,262	20,737
Other cattle.....	44,485	45,065	43,546	41,689	39,812	37,067	35,855
Sheep.....	48,615	48,866	48,900	47,616	48,625	49,956	49,719
Swine.....	72,909	74,584	71,374	67,503	67,766	64,618	58,933

Kind.	Annual Average, 1910 to 1914.	1910.	1900.	1890.	1880.	1870.
Horses.....	20,430	19,833	18,267	14,969	10,357	7,145
Mules.....	4,346	4,209	3,264	2,295	1,812	1,125
Milch cows.....	20,676	20,625	17,135	16,511	12,443	8,935
Other cattle.....	38,000	41,178	50,083	33,734	22,488	13,566
Sheep.....	51,929	52,447	61,503	35,935	35,192	28,477
Swine.....	61,865	58,185	62,868	57,409	47,061	25,124

The Federal Department of Agriculture estimates the production of meat and milk since 1909 as follows:

¹ The figures for 1914-1918 are taken as of January 1st. Figures for 1870-1900 are taken as of June 1st. Figures for 1910 as of April 1st.

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ESTIMATED PRODUCTION OF MEAT, MILK AND WOOL¹

(Figures are in round thousands, i. e., 000 omitted)

Product.	1909.	1914.	1918.	1917.
Beef ² (pounds).....	8,138,000	6,078,908	6,670,938	7,384,007
Pork ² (pounds).....	8,199,000	8,768,532	10,587,765	8,450,148
Mutton and goat (pounds).....	615,000	739,401	633,969	491,205
Total (pounds).....	16,952,000	15,586,841	17,892,672	16,325,360
Milk ² (gallons).....	7,466,408	7,507,000	8,003,000	8,288,000
Wool, including pulled wool (pounds).....	289,420	290,192	288,490	281,892
Eggs produced ³ (dozens).....	1,591,000 ⁴	1,774,000	1,848,000	1,884,000
Poultry raised ⁵ (number).....	488,000 ⁴	544,000	567,000	578,000

Product.	1918.	1919.	Per Cent Increase or Decrease, 1919 over 1909.
Beef ² (pounds).....	8,465,000	7,500,000	-7.84 ⁶
Pork ² (pounds).....	11,248,000	12,868,000	56.94
Mutton and goat (pounds).....	537,000	637,000	3.57
Total (pounds).....	20,250,000	21,005,000	23.90
Milk ² (gallons).....	8,438,000	8,495,000	13.7
Wool including pulled wool (pounds).....	298,870	308,459	6.57
Eggs produced ³ (dozens).....	1,921,000	1,957,000	23.00
Poultry raised ⁵ (number).....	589,000	600,000	22.95

¹ See Year Book, 1918, United States Department of Agriculture.

² Estimated for 1914-1917 by the Bureau of Animal Industry. Figures for meat production for 1918 are tentative estimates based upon 1917 production and a comparison of slaughter under Federal inspection for nine months of 1918 with the corresponding nine months in 1917.

³ Office of the Secretary, Circular No. 125.

⁴ Annual averages for 1910-1914: Eggs, 1,695,000,000 dozen; poultry, 552,000,000.

⁵ Decrease from 1909 to 1918

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A significant factor in the present and future situation as to milk production has been the increase in the number of calves slaughtered. The number slaughtered in the United States under Federal inspection and the estimated number slaughtered otherwise (including farm) together with the percentage of the total that was Federal inspected follows:

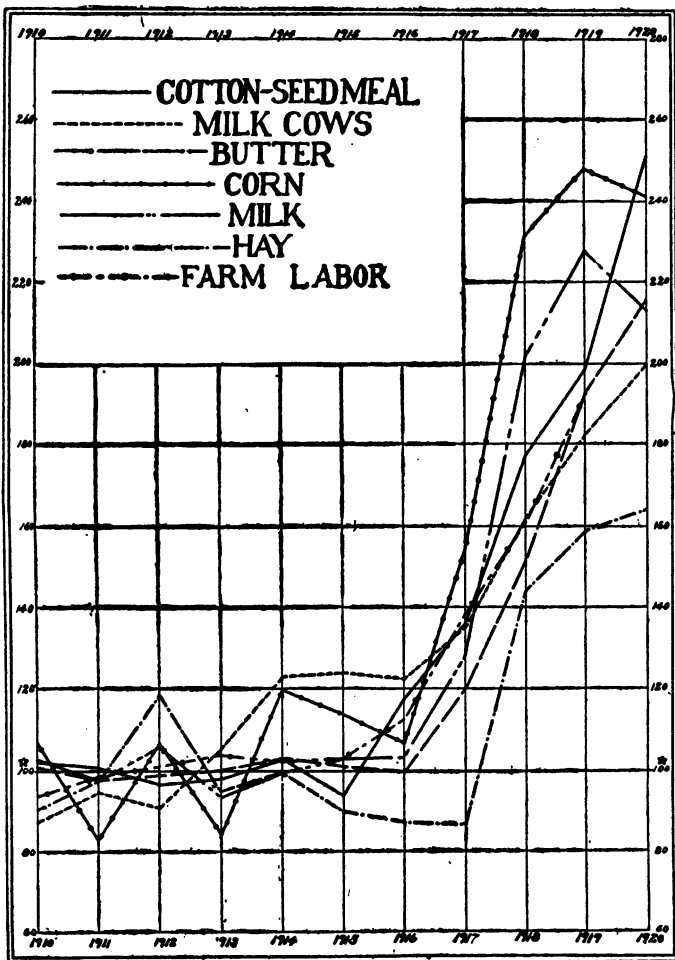
CALVES SLAUGHTERED IN THE UNITED STATES, 1914-1919

	1914.	1915.	1916.	1917.	1918.	1919.
Federal inspection....	1,696,962	1,818,702	2,367,308	3,142,721	3,456,303	3,969,019
Other.....	2,964,400	2,820,800	3,406,600	3,888,000	4,310,800	5,072,000
Total.....	4,661,400	4,639,500	5,773,900	7,030,700	7,767,200	9,041,000
Percent Federal inspection.....	36.4	39.2	41.0	44.7	44.5	43.9

The chart on the next page reflects clearly the unstable competition in recent years between the prices for feeds and labor going into milk and the prices for milk and its products and for milk cows.

Corn, hay and cottonseed meal are chosen as typical feeds reflecting market opportunities. Other cereals hover around the price of corn; and cottonseed meal is typical of prices on protein feeds. Throughout the war period corn increased most rapidly in price of any of these products. Cottonseed meal for two years lagged slightly in price as compared with corn and milk, but in the latter part of 1919 exceeded the relative increase in price for both corn and milk and continued to rise while the

**CHART NO. IV.—THE RELATIVE INCREASE IN WHOLESALE PRICES
FOR MILK, BUTTER, AND MILK COWS AND FOR CORN, COTTONSEED
MEAL, HAY, AND LABOR IN THE UNITED STATES, 1910-1920**
(The Average for 1910 to 1914 inclusive is taken as 100)¹



¹ The wholesale prices are from Monthly Crop Reporter: wages from Bureau of Labor Statistics. The prices and wages are given on page 33.

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prices on both the others fell. The fall in the price of milk was greater than that for corn and these were the only two of these products showing a declining price in 1919. Butter in relative increases lagged behind cottonseed meal, corn and milk, reaching a common point with milk in the latter part of 1920. For labor the average paid for farm labor for the United States by the month without board is taken, the average being available only up to January 1, 1919. This wage is not typical for dairy districts near munition and manufacturing centers. The relative increase in the price for dairy cows was not as rapid as for the other products, with the single exception of hay. It is with these relative price fluctuations in mind that milk producers have made the choices reflected in the diminishing per capita production of milk noted above. The price of milk has not increased as rapidly as have feed prices.

Year.	Milk (quart), Jan. 1.	Butter (pound), Jan. 1.	Milk Cows (head), Jan. 15.	Cottonseed Meal Jan. 15.	Hay (ton), Jan. 1.	Corn (bushel), Jan. 15.	Farm Labor without Board by the Month. Average for the U. S.
1910.....	\$0.0412	\$0.287	\$41.18	\$32.33	\$11.37	\$0.6320	\$27.50
1911.....	.0391	.278	44.70	31.83	12.24	.482	28.77
1912.....	.0425	.281	42.89	30.42	14.85	.622	29.58
1913.....	.0375	.284	49.51	39.97	11.86	.489	30.31
1914.....	.0400	.292	57.99	32.49	11.29	.696	29.88
1915.....	.0413	.287	58.47	29.53	12.42	.662	30.15
1916.....	.0413	.283	57.79	37.03	10.94	.621	32.83
1917.....	.0513	.340	63.92	42.95	10.86	.900	40.43
1918.....	.0808	.431	76.54	55.93	18.09	1.348	47.07
1919.....	.0913	.549	86.10	62.81	19.92	1.447	56.20
1920.....	.0853	.613	94.42	79.39	20.55	1.404

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In view of all the facts it is clear that the price of milk is vital to the dairymen, to the consumer and to the welfare of the nation. The consumer wants to know what economic forces are determining the price the farmer receives. The consumer is deeply concerned as to the elements in the cost of distribution and as to whether the most economical methods of distributing milk consistent with proper sanitary precautions are being used. The farmer wants to know why he gets the price he does and why distribution costs are what they are. And all who are considerate of our national well-being and the future of the best in civilization must become concerned as to whether the price the dairyman receives is sufficient to maintain a standard of living among country workers consistent with approved standards of human well-being.

It is to get at these larger aspects of one of our greatest—if not our greatest national problem—that this book is written.

CHAPTER II

The Forces that Fix the Price of Milk

Often during the author's public activities relating to the price of milk, consumers and milk buyers have expressed grave fears lest the forces that determined the price for milk paid to the farmer were unduly influenced by some association or "union" of milk producers. Likewise, on numerous occasions, milk producers have shown concern lest the price they received for milk was unduly low because of the strategic or "monopolistic" buying power of the manufacturer or the milk distributor, or because of the "prejudice" of the consumer. It is pertinent, therefore, to inquire just what the factors and forces are that in the long run determine milk prices.

To be sure, these forces vary as between sections and as between seasons. Moreover, first one factor then another is the real determinant. Yet the forces which fix the price of milk to the producer can be ascertained, and at any one time or place the relative importance of each can be estimated with considerable accuracy. These forces are:

1. The competition between whole milk and other human foods at given prices;
2. Racial, national and local food habits with especial regard for what the consumers believe to be the food value of whole milk as compared with other available foods at the season's prices;

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3. The value of milk for manufactured products such as butter, cheese, casein, condensed milk, ice cream, and milk powders;

4. The competition of butter fats with fats from other animal and vegetable sources;

5. The value of milk as a food for other farm animals;

6. The cost of producing milk;

7. The cost of producing milk as compared with the cost of producing other products of the farm, and compared with the cost of securing foods from the forest, the air or the sea with the resultant relative scarcity or abundance of these alternative foods;

8. The competition between different regions and different countries with varying adaptability to milk production;

9. The cost and method of distributing whole milk and milk products;

10. Transportation charges and facilities (local, national and international);

11. The buying power of milk distributors and manufacturers;

12. The selling powers of milk producers.
These various forces are usually lumped together as the "law of supply and demand."

Certain of these forces are subject to more or less control by consumers, others by dairymen, some by distributors and manufacturers, a few by city, state and national law makers, some by the productive power and policies of other countries; but not one is

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solely and absolutely under the control of any one of the parties interested. To be sure, consumers will decide what they will eat and farmers what they will produce. But the choices of consumers and producers, if rationally made, are each a resultant of those larger forces. The consumer will not refuse to eat dairy products if milk and its by-products can be secured at reasonable prices as compared with other foods of similar food value; nor will the farmer refuse to produce if the net returns from milk are equal to or greater than the net returns from the other alternatives before him.

The Dairy Division of the National Department of Agriculture has made the following estimates as to the uses to which the milk produced in the United States in 1917 was put:¹

USES TO WHICH MILK WAS PUT IN 1917 (CALCULATIONS BASED ON ESTIMATES)²

Item.	Pounds of Milk.	Per Cent.
Produce of 22,768,000 cows at 3716 pounds per annum.....	84,611,350,000	....
Disposition of Milk Product:		
1,605,587,525 ¹ pounds of butter (at 21 pounds milk).....	33,717,338,000	39.9
420,000,000 pounds of cheese (at 10 pounds milk).....	4,200,000,000	5.0
1,353,805,000 ¹ pounds of condensed milk (at 2½ pounds milk)	3,384,012,000	4.0
210,000,000 gallons of ice cream (weighing 6 pounds to the gallon, 10 per cent fat).....	3,150,000,000	3.7
100,000,000 persons, 45 per cent at 0.7 pound a day (cities); farms with dairy cows 30 per cent, 1½ pounds a day; other farms and small towns, 25 per cent, 1 pound a day, approximately	36,500,000,000	43.1
17,500,000 calves, whole milk requirement (estimated).....	3,660,000,000	4.3
Total	84,611,350,000	100.0

¹ United States Department of Agriculture Circular No. 85.

² Corrected estimates compiled by Bureau of Markets, March, 1919.

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These figures were put in chart form as follows:

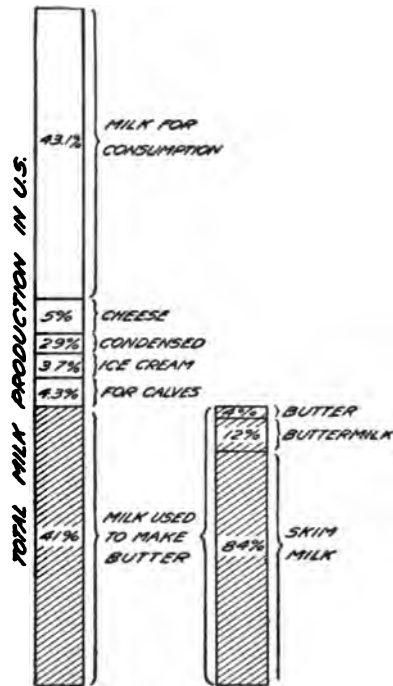


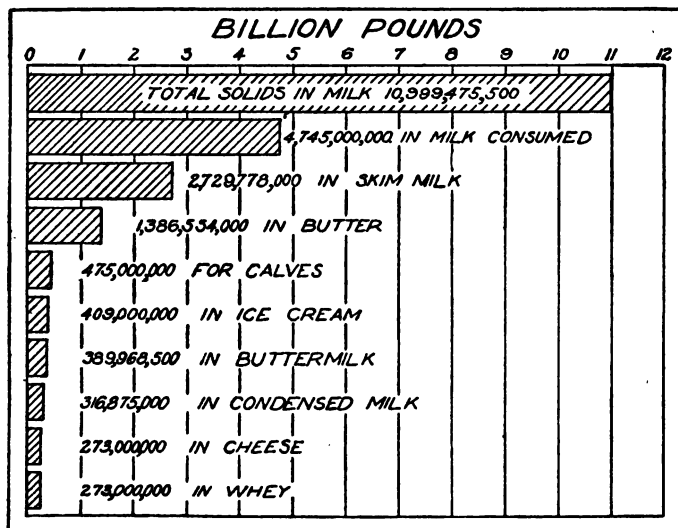
CHART NO. V.—USES TO WHICH THE TOTAL MILK PRODUCED IN THE UNITED STATES IS PUT¹

Inasmuch as it is from the milk solids that the by-products are made, we can best picture the food uses of milk from the following chart showing the total amount of milk solids produced in 1917 and the proportion that went into the different products.

¹ Figure 9, Circular 85, p. 14. The side chart shows the estimated proportion of the milk used to make butter going into buttermilk and skim milk.

FORCES THAT FIX THE PRICE OF MILK

CHART NO. VI.¹—PROPORTION OF TOTAL MILK SOLIDS PRODUCED
IN THE UNITED STATES IN 1917 GOING INTO THE
DIFFERENT MILK PRODUCTS



From this chart it is clear that the use of whole milk (43.1 per cent of the total) is the leading factor in determining the price received by the farmer. Hence, the actual or supposed competition of whole milk with other foods is vital to the producer as well as to the consumer. The consumer's choice, however, is directly influenced by the other alternatives in foods at prices offered.

From the standpoint of national welfare, either sufficient milk must be consumed to provide those protective elements in milk that are essential to

¹ *Ibid.*, p. 16.

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sound nutrition, or these protective elements, discussed more fully in the later chapter on the "Food Value of Milk", must be secured in sufficient quantities from other sources. These protective elements are found most surely and most cheaply in milk.

For two reasons Americans generally have not used as much whole milk as price facts warrant, even after these facts are known. One reason is that, though we all think of milk as a food for children, many regard it only as a beverage for grown-ups—a pleasant addition to the meal. We have not yet come to think of milk as a large ingredient of a satisfactory meal.

The second reason is that humans prefer foods they can chew to foods they can drink; they ask for something to eat, not for food containing nourishment. This instinct is deep seated. It should be met not by dispensing with milk but by using milk and milk solids plentifully in solid foods in addition to the use of milk as a beverage. In view of these facts, any campaign for an increase in the consumption of milk should stress its value in solid foods, as did the circulars issued early in the spring of 1918 by the Food Administration of Pennsylvania. Some of the recipes given in one of these circulars appear in the footnote.¹

¹ TOMATO SOUP.

6 cupfuls milk	$\frac{1}{2}$ teaspoonful soda
6 tablespoonfuls corn flour	3 teaspoonfuls salt
3 cupfuls canned tomatoes	$\frac{1}{4}$ teaspoonful pepper

Heat five cups of milk. Mix the corn flour and seasoning with one cup of cold milk; add to the hot milk and cook over hot water. Cook and strain the tomatoes, add soda and mix with the sauce just before serving.

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Differences in national and racial food habits disclose possibilities for special education. As a rule, negroes do not consume milk in the quantities Anglo-Saxon peoples do. Professor McCollum has accounted by this fact for the high rate of tuberculosis among the colored people in certain crowded sections of our cities. In tropical regions milk is

SCALLOPED VEGETABLE OR FISH

- | | |
|-----------------------------|------------------------------------|
| 2 tablespoonfuls corn flour | 4 cupfuls cooked vegetable or fish |
| 1 teaspoonful salt | 1½ cupfuls seasoned crumbs |
| pepper | 2 cupfuls milk |

Make a sauce of the first four ingredients; pour over the vegetable or fish in a baking dish; cover with the crumbs, and brown in the oven.

CREAMED CODFISH

- | | |
|-----------------------------|---------------------------|
| 4 cupfuls milk | 1 cupful shredded codfish |
| 4 tablespoonfuls corn flour | chopped parsley |
| pepper | |

Heat the milk over hot water, and thicken with corn flour mixed in a little of the milk. Add the codfish and parsley, and serve.

FRIEZZED BEEF

- | | |
|----------------------|-----------------------------|
| ½ pound chipped beef | 3 tablespoonfuls corn flour |
| 2 tablespoonfuls fat | 3 cupfuls milk |

Melt the fat in a hot frying pan, add meat, and stir until it browns and curls. Pour the milk into the pan and stir in the flour, which has been moistened with a little of the cold milk. Cook until smooth and creamy.

MILK OR CREAM TOAST

Pour hot, salted milk over slices of toast; or, make a sauce as for scalloped vegetable, and pour this over the toast. Grated cheese may be added to the sauce, if desired.

COTTAGE CHEESE

Pour boiling water into thick, sour milk, stirring all the time until the whey begins to separate from the curd. Pour into a thin muslin bag (a small salt bag will do) and hang up to drain. When whey has all drained out, rub it smooth with a spoon; add salt and pepper, moistened with milk or cream.

BAKED RICE PUDDING

- | | |
|-----------------------|------------------------------|
| 3 tablespoonfuls rice | ½ cupful sugar or corn syrup |
| 1 quart milk | ¼ cupful raisins |

Place all in a baking dish and cook in a slow oven, stirring occasionally, until of a creamy consistency. Serve hot or cold. This may be cooked in a double boiler by using one-half cupful of rice.

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generally little used, though new methods of preservation may now increase its use in these climates. The consumption of dairy products by individuals of any race or section will vary with the season. Larger quantities of milk are used in the summer and less in late autumn and more as the days begin to lengthen, reaching greatest consumption about Easter and declining slightly thereafter until the return of warm weather.

Consumption, moreover, is affected by suggestion. In one city of Pennsylvania an "Eat More Milk" campaign, carried on in newspapers alone, increased the total consumption of milk in that city ten per

JUNKET

1 quart milk

1 rennet tablet

honey or corn syrup to sweeten and flavor

Heat the milk until lukewarm, add the honey or syrup. Dissolve the tablet in a tablespoonful of cold water, stir this into the warm milk and pour into cups. Set in a warm place until it becomes firm; chill and serve. Vary the flavor by using caramel, cocoa, chocolate, vanilla or nutmeg. When frozen like ice cream it is delicious.

CORN-STARCH PUDDING

1 quart milk

6 tablespoonfuls corn-starch

4 tablespoonfuls sugar

4 tablespoonfuls cocoa

a few grains of salt

Heat three cupfuls of the milk. Mix sugar, corn-starch and cocoa with the remainder of the milk. Pour this into the hot milk, and cook over hot water for thirty minutes. Add salt and pour into a mold. When cold, serve with cream or top milk.

Buy at least a pint a day for every member of the family. No other foods can take its place for invalids and children. Save on fat, wheat, sugar, meat—but NOT ON MILK!

Use all of the milk—waste no part of it. Use skimmed milk for cooking. Serve the top milk with breakfast foods and puddings. Use sour milk in making muffins, griddle cakes or cottage cheese. Save the whey for bread making.

One pint milk yields 14 grams protein and 314 calories.

One pint skimmed milk yields 15 grams protein and 166 calories.

One pint buttermilk yields 13 grams protein and 165 calories.

One pint whey yields 4 grams protein and 125 calories.

One pound cottage cheese yields 94 grams protein and 510 calories.

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cent in two weeks. By a concert of many methods the per capita consumption of milk in Philadelphia in the early spring of 1918, when milk was 13 cents a quart, was brought up to where it had been when milk was 8 cents a quart.

The consumption of milk in a family depends upon whether wages are rising or falling as well as upon the trend in the price of milk. Miss Ethel Rupert, for the Society for Organizing Charities in Philadelphia, took responsibility for a report to the author as to whether the poor people in the city of Philadelphia were decreasing milk consumption because milk had increased in price. Her study was made in April and May of 1918. Data was secured from a total of 1130 working men's families in the city of Philadelphia. Comparison in wages and milk consumption were made with a similar period in 1917. During this year milk had advanced from 12 to 13 cents per quart. The results were as follows:

RELATION OF MILK CONSUMED TO WAGES, IN WAGE EARNERS' FAMILIES IN PHILADELPHIA

Number of Families.	Percentage of Total.	Income Increased or Decreased.	Average Wage, 1918.	Average Wage, 1917.	Average Increase or Decrease in Wages.	Average Amount of Milk Used.	Number of Families Increasing Use of Milk.	Percentage of Total.	Number of Families Decreasing Use of Milk.	Percentage of Total.	Families Making no Change in Milk Used.	Percentage of Total.	Took no Milk.
114	10	Unknown	.....	.....	.....	2.5	34	30	31	27	46	40	3
128	11	Decreased	15.02	21.45	6.43	2.3	26	20	44	34	45	35	13
234	21	Stationary	19.00	19.00	2.6	65	27	70	29	82	35	19
654	58	Increased	22.31	15.86	6.46	2.6	201	30	194	29	228	35	31

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This was a year in which wages generally were increasing. When wages advanced there was a slight tendency to increase the use of milk; and a slight tendency to decrease the use of milk when wages did not keep pace with living costs. When wages remained stationary milk consumption remained stationary. The significant point, however, is the number that made no change, whether wages increased or decreased. Milk is a family necessity.

The consumption of milk is also directly influenced by the prices of substitute foods on the market. In Philadelphia the consumption of whole milk was kept constant despite a fifty per cent increase in price. But a fifty per cent increase in the price of butter brought a substantial decline in consumption. In other words, there were no foods then competing successfully with whole milk at the price level of thirteen cents, while with the same proportional increase in the price of butter, other fats came promptly into competition with butter.

The belief of the people as to what is a fair price for milk is a big factor in deciding the quantities in which they will buy it. The author has seen the leaders of a farmers' organization kill the consumers' confidence in the relative food value of milk at existing prices by advertisements containing inaccurate statements as to the "huge profits" being exacted by milk dealers. The purpose in this was to create prejudice against the milk dealers. In doing so, the farmers were quite indifferent to the fact that they were also prejudicing the consumer

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against the very commodity they wanted to sell. On the other hand, more than once milk distributors have sought to turn public feeling against the producers with the result of arousing the distrust of the consumer in the fair price of the product they were distributing. Moreover, certain consumers have talked of boycotting milk when it was the best food purchase possible at the time. All these psychological influences are factors in price, quite aside from the actual facts as to the relative food value of milk.

Of the total amount of milk produced in this country, about 39.9 per cent goes into butter and into the by-products of skimmed milk, 5 per cent into cheese, 3.7 per cent into ice cream and 4 per cent into condensed milk—a total of 52.7 per cent. Since over half the total goes into these manufactured products, the demand for milk for these purposes is an important influence in fixing the price.

Manufactured milk products exert a big influence on the price of milk because in this form the milk solids can be stored from seasons of plenty until seasons of scarcity and transported from regions and countries of plenty to regions and countries of scarcity. These influences are so significant that Chapter III is devoted to them. Later pages also discuss the extent of independence and interdependence between local, primary, national and international markets (Chapter IV). Suffice it to say here that on the whole the movement of milk and milk products is so free that no local farmers' organization can, during the season of greatest production,

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command a price for whole milk for city use above the general market value of milk for manufactured products; nor can local milk dealers and manufacturers long keep a price to local farmers below the demand of the wider market. The comparatively free interplay of forces as outlined more fully in the two succeeding chapters go far toward assuring a fair market price to dairymen and to milk buyers.

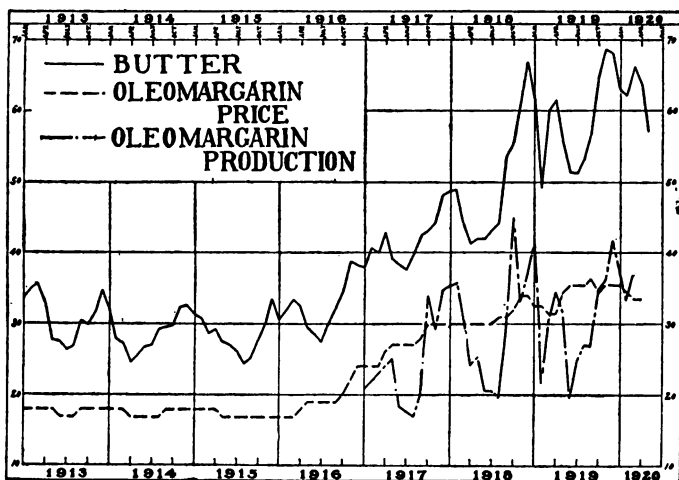
While all foods are competing through price for selection by the consumer, the competition between butter fats and fats from other animal and vegetable sources is the keenest of food wars.

The following chart depicts the struggle between butter and but one competitor, viz., oleomargarin, produced from both animal and vegetable oils. While oleomargarin has escaped the seasonal price fluctuations of butter, its price curve has in general moved with that of butter. The production of oleomargarin, however, is seen to respond quickly to the fluctuations in the price of butter, indicating that as the price of butter rises consumption is transferred to oleomargarin. It is obvious that the possibility of substitution which exists here tends to equalize the prices of both products.

Fats we must have, but their sources are many. The influence of the price of butter over the price of milk is the one doubtful element of the future. The danger is that this influence will keep the price to the farmer too low to encourage production rather than that it will keep the price of whole milk too high for the city earner.

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CHART NO. VII.—THE PRICE OF BUTTER AND OLEOMARGARIN
PER POUND, 1913-1920, AND THE PRODUCTION OF
OLEOMARGARIN IN MILLIONS OF POUNDS,
1917-1920¹



When the price of milk gets too low for profitable sale as whole milk or milk products, the dairyman has the alternative of feeding his milk to young animals. Of the present production 4.3 per cent is used for this purpose. The protective elements in milk which make it the food par excellence for human beings, make it also the food par excellence for growing animals. Moreover, the chemical food content itself is worth considerable for this purpose. While this alternative will act as a governor when surplus

¹ The price for butter is the average for the months for creamery extra Chicago and for oleomargarine is for standard uncolored at Chicago. From Bureau of Labor Statistics.

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quantities are small, it cannot be an influential price factor for all milk.

Unless milk producers can get net returns from milk equal to the returns from other farm products or from efforts in other industries, milk will not be produced. To the extent that dairymen at any given time choose other alternatives with larger net returns, the production of milk will be decreased. In proportion in which milk offers larger net returns than in the long run can be secured from efforts in other fields, milk production will be increased. These cost factors determine the relative scarcity and abundance of foods. They are, therefore, the primary factors in determining price, and hence a separate chapter (V) is devoted to the cost of producing milk.

But some sections and some countries are better fitted for milk production than others. The rivalry in prices between various sections and countries is so important that the major portion of the two following chapters is devoted to it. A given dairyman may not be compensated for all his expenses of production if milk can be produced on other farms or in other sections at less cost. There is as much competition between areas and countries as between foods; and the price influence of areas peculiarly adapted to milk production is ever present.

But to the cost of production must be added, for that milk consumed as whole milk, the costs of transportation and distribution. These costs plus expenses of production are the important, though not the only forces that determine what the con-

FORCES THAT FIX THE PRICE OF MILK

sumer pays for whole milk. Distribution and transportation costs and facilities also influence directly the price which the producer receives. If these costs are excessive the consumer chooses something else to eat as far as possible—and that “possible” is often sufficient to cause producer’s prices to tumble. In this sense the price the producer receives is the price the consumer pays, less the amounts taken out for transportation and distribution. To all these costs, including the costs incident to keeping milk wholesome, the chapters in Part II are devoted.

But after all these price determining forces are weighed there still remains the buying and selling powers, the comparative bargaining powers, of those who buy and those who sell milk. The general forces do not automatically fix a price undisturbed by efforts of buyers and sellers to swing the price to their advantage. The price for any day or month is a man-made guess as to where the fundamental price-fixing forces will allow the price to rest. If the distributors and manufacturers have developed a well organized purchasing power and the sellers of milk little or no organized selling power, the price for milk is below what it would be if the producers have a well organized selling power and the buyers have a poor purchasing power. In both cases the price is different from what it would be if the buying and selling powers were equal, as they must be to arrive at a fair price. These bargaining forces are discussed further in Chapters VI and VII.

Such, in the main, are the influences that deter-

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mine the price of whole milk and of manufactured dairy products. They are not simple, but they are all important. For in their free and proper expression lies the well-being of all our people, both those who produce in the country and those who consume in the city.

CHAPTER III

Manufactured Milk Products in Their Relation to Price

The amount of butter produced in this country increased from 1,491,871,673 pounds in 1899 to 1,619,415,263 pounds in 1909 and fell to 1,605,587,525 pounds in 1917. This was an increase of about 8 per cent in production from 1899 to 1917. The estimated production for 1919 was 1,549,000,000 pounds, a decrease over 1917. The cheese produced increased from 298,344,654 pounds in 1899 to 320,532,181 pounds in 1909 and to 420,000,000 pounds (estimated) in 1917, an increase of 40 per cent in the same period. The estimated production for 1919 (378,000,000 pounds) was below that of 1917. The production of condensed milk in the United States increased from 186,921,787 pounds in 1899 to 494,796,544 and 1,353,605,000 pounds in 1909 and 1917 respectively, an increase of 64 per cent in these dozen and a half years. The production for 1919 (estimated at 1,815,502,790 pounds) was substantially above that of 1917. The figures for 1899 and 1909 are from census reports, while those for 1917 and 1919 are the estimates of the United States Department of Agriculture. The value of all these products increased from \$136,365,983 in 1897 to \$307,255,277 in 1899, to \$498,567,866 in 1909 and to \$863,000,000 in 1917. Over one-half (52 per cent) of the milk produced in the United States goes into

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manufactured milk products, including ice cream. This fact and the relative amounts and values produced as given above will indicate at once the important bearing that the prices for the various manufactured products have on whole milk.

THE PRODUCTS MANUFACTURED FROM MILK IN THE UNITED STATES
AND THE TOTAL QUANTITIES OF EACH FOR 1918 AND 1919

Products.	1918 (pounds).	1919 (pounds).
Creamery butter.....	793,275,309	851,269,140
Whey butter (made from whey).....	5,510,213	5,597,308
American cheese (whole milk).....	247,276,503	281,836,015
American cheese (part skim).....	9,102,159	6,189,192
American cheese (full skim).....	6,610,993	6,985,356
Swiss cheese (includes block).....	18,586,505	20,387,306
Brick and Munster cheese.....	43,332,215	37,521,004
Limburger cheese.....	8,808,140	7,625,541
Cottage, pot, and bakers' cheese.....	27,802,037	29,785,329
Cream and Neufchatel cheese.....	5,774,630	5,500,639
All Italian varieties of cheese.....	2,042,234	3,987,361
All other varieties of cheese.....	11,088,236	9,661,497
Dried casein (buttermilk product).....	97,196	722,151
Sweetened condensed skimmed milk (case goods).....	8,653,067	7,231,630
Sweetened condensed unskimmed milk (case goods).....	411,224,893	568,250,861
Sweetened condensed skimmed milk (bulk goods).....	46,303,494	61,791,696
Sweetened condensed unskimmed milk (bulk goods).....	40,871,997	36,910,038
Unsweetened evaporated skimmed milk (case goods).....	12,049,163	3,626,172
Unsweetened evaporated unskimmed milk (case goods).....	216,437,919	1,159,217,649
Unsweetened evaporated skimmed milk (bulk goods).....	56,781,752	65,442,286
Unsweetened evaporated unskimmed milk (bulk goods).....	183,611,949	74,985,073
Evaporated part or full skimmed milk modified with foreign fat (case goods).....	41,033,855	62,262,225
Evaporated part or full skimmed milk modified with foreign fat (bulk goods).....	7,591,182	2,748,120
Sterilized milk (canned same as condensed).....	6,257,710	4,414,818
Condensed and evaporated buttermilk.....	6,534,023	22,535,580
Dried or powdered buttermilk.....	4,341,157	5,278,827
Powdered whole milk.....	4,164,334	8,660,785
Powdered skimmed milk.....	25,432,007	33,076,131
Powdered cream.....	654,360	592,070
Malted milk.....	15,654,243	17,495,887
Milk sugar (crude).....	2,749,928	6,221,342
Ice cream of all kinds (gallons).....	122,900,106	127,840,204

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The preceding table gives the products manufactured from milk in the United States in 1918 and 1919, with the quantities of each.

Milk is worth more for consumption as whole milk than it is in any manufactured form. In order to meet fluctuations in demand the whole milk distributor must have a supply equal to his maximum demand on any day or in any season. This means he will usually have a larger or smaller amount of what he calls surplus milk. As the value of the milk for whole milk consumption is usually above its value when made into manufactured products, the dealer may have to take a loss on the surplus so manufactured. Moreover, some whole milk dealers do not have the facilities for the efficient manufacture of milk products.

This surplus problem of the whole milk dealer is shown by the chart on page 54 giving separately the supply received through the regular receiving stations of this dealer and the demand from his consumers for milk (the whole milk sold) for each of the months for the years 1915, 1916 and 1917, respectively.

It will be noticed that in 1915 the period of greatest supply came in the first week of June, with a slight increase in the first week in August and a marked decline in the last week of September. The minimum production was received in the first week in December. In the year 1916 the time of high supply comes about June 10th, with a slight increase about the middle of August, and the period of lowest

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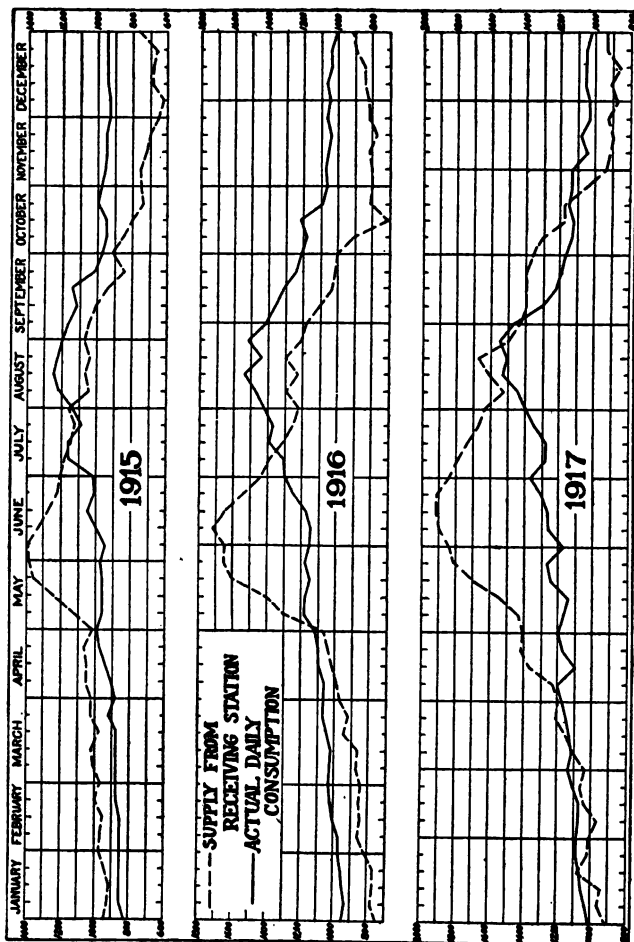


CHART No. VIII.—THE RECEIVING STATION SUPPLY AND THE CONSUMERS' DEMAND FOR WHOLE MILK FOR ONE MILK DISTRIBUTOR, 1915-1917

MANUFACTURED MILK PRODUCTS

supply is reached in the middle of October, with the second minimum of production in the middle of November, after which time the production gradually increases. For the year 1917 the maximum production is reached the last week in June, with an increase in supply the last week in August and the minimum supply about the middle of December. Maximum consumption came in the middle of August.

It is to be noted that during a considerable portion of each year this dealer had to buy a varying amount of milk from other sources than his own receiving station supply. This means that he bought milk from outlying creameries in the months when he was short, rather than have the annual expense of maintaining his own stations. Had he a supply of his own sufficient for his trade the year round, his surplus would have been all the greater. It is often a close question as to whether it pays a milk dealer to get a supply sufficient for all the year. If he does he has the costs and risks of surplus. If he does not he must pay a premium to some concern for milk when he is short. In the last year or two some have made up this shortage with remade milk. (See Chapter VII.)

Most important of all it is to be noted that neither supply nor demand could be effectively prophesied in their relation to each other. Thus in 1915 in the last week in September when there is an increase in the use of milk, probably because of hot weather, there is at the same time a rapid fall in the amount of milk produced. The same thing is to be noted

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for the first week in May of the same year. In the autumn months, when the consumption remains fairly constant, production decreases very rapidly. The effect of a hot and cool week following each other closely is shown in the month of August, 1916. During the middle of that month there is a marked increase in consumption of whole milk, with a marked decrease in production because of hot weather, followed by a decrease in consumption and an increase in production because of cool weather. Again in the middle of October, 1916, there is an increase in consumption for the very week that brought the minimum decrease in production. The actual supply and demand were seldom if ever at equilibrium.

Taking the average receipts for October, November and December, 1919, as a base, seven distributing and manufacturing companies in the Philadelphia district had a surplus in pounds for the first six months of 1920 as follows:

January.	February.	March.	April.	May.	June.
3,631,261	4,285,799	6,346,028	6,712,848	12,631,506	15,035,500

The amount of this surplus to be manufactured will vary in the same city as between dealers, and indeed for the same dealer in different years. Here is one company which received 1,600,000 quarts in the December of 1919 as compared with 3,100,000 quarts in the previous June, while another dealer in

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the same city with about the same receipts for December had purchased but 250,000 quarts more in June than he received in December. Another dealer will be using but one-third of his total purchases in June in his whole milk trade and yet use all his supply for the whole milk trade in December.

To secure a supply adequate for whole milk sales the dealer must (1) have the facilities for manufacturing the surplus or (2) take the losses on wasting the surplus, or, (3) maintaining a supply fairly constant with sales, pay a premium for milk in time of scarcity. All methods are used, but dealers are as a rule equipping themselves to care efficiently for all the milk coming to their platforms, at least from their regular patrons. By surplus milk is meant the excess of milk coming to the plants of whole milk dealers at certain seasons of the year above the normal sales of whole milk. This surplus is really insurance for an adequate supply of whole milk to meet varying trade demands and losses in transit or losses due to sour milk.

The exact time of the occurrence of the milk surplus of course varies from state to state, as well as within narrower boundaries, but in general it comes in April, May and June, with a decrease below the average in certain other months, particularly in October, November and December.

If the farmer gives the dealer during three months of the year say one-fifth more milk than the distributor may be able to sell through his whole milk trade, the dealer must possess some other means of

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getting rid of this extra milk at the usual market price, or he must pay a smaller amount to the producer. Similarly, if the producer has a contract with the distributor to furnish him with a certain amount of milk per day, and has, therefore, at times a surplus on hand which he is unable to get rid of except through extraordinary channels at very low rates, it necessarily follows that he must get more for the milk he sells.

In general there are two ways in which the milk surplus may be utilized: It may be converted into such form as will allow it to be stored for at least several months; or there may be created some new demand for milk at the particular season at which the surplus comes. If the first means be selected, it is usually converted into butter, cheese or condensed milk. Cream may be taken from the milk and stored for as long as six months, without any substantial change in the bacterial count.

It is commercially impossible to create a demand for milk that will automatically take care of the surplus from week to week. For instance, the peak in ice cream demand will not come before July 4th, by which time production is declining.

In the past the price of butter was based on the cost of turning milk into butter on the farm or in small cross-road creameries. When this was the case no special manufacturing facilities were needed by a whole milk dealer to compete in price with those butter manufacturers who had efficient equipment. Of recent years, however, the large factory has been

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gaining over domestic manufacture or small creameries because of savings in the manufacture of skimmed milk and lower unit costs due to larger quantities handled. Many milk dealers are, therefore, now equipped to condense their surplus skim milk or convert it into skim milk powder. Those who are not thus equipped are losing out in the economical handling of milk. Other dealers have added an ice cream business to their whole milk business in addition to putting their own butter and cheese out for sale on their retail milk wagons. More and more, therefore, the surplus is being cared for by milk dealers economically and without waste, though large quantities of skim milk are still turned into the creek or the sewer by those not equipped to save it. It is to the interest of all that the milk of the country flow into those plants equipped to save and utilize economically all the milk solids. Those dealers make most money who can immediately take advantage of the best the market offers in price, whether that be for whole milk, for condensed milk, for cheese, for skim milk powders or for casein.

However the dealer's surplus may be handled (and surplus he must have), there must be a direct relation between the price the dealer can afford to pay for whole milk as based on the price paid by the consumer and the price he can receive for the product or products into which he manufactures his surplus. Indeed, the relation between the price which the dealer receives for his surplus in the form of manufactured products and the price he can pay for whole

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milk for distribution to consumers is so close that it may be possible to use the former in computing the latter.

A plan for using the price of butter and cheese, the leading products manufactured from milk, as a basis for determining the price of whole milk has recently (1919) been tried out in the New York district. Table A gives the value of whole milk at the different price levels of butter and cheese.

The price of whole milk thus found is readjusted by adding the sums indicated in Table B for nine months, while for the three months of maximum production 15 cents a cwt. is deducted. This table also gives the price for whole milk as based on the actual market values of butter and cheese that prevailed by months for the year 1918 and for the first two months of 1919.

The committee reporting this plan thus explained its application:

We wish to call your particular attention to the fact that this plan *does not* mean that producers would sell their milk at its *value* in butter and cheese. Not only have we provided a very liberal allowance for skim milk and whey, but in addition we have allowed the New York market price for high grade goods without any deduction for manufacture, packing, freight and commission. If milk were manufactured into butter or cheese these costs would necessarily have to be deducted from the New York market prices, and in figuring the value of this allowance to the producer, we have used the very conservative figures of 3 cents per

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TABLE A.—VALUE OF WHOLE MILK BASED ON THE MARKET
VALUES OF BUTTER AND CHEESE

Butter Yield, 4 Per Cent Milk, Allowing 16 Per Cent Over-run (pounds)	Butter, Cents per Pound Fresh. Extras 92 Score.	Value.	Value, Skim Milk per cwt. of Whole Milk.	Total Value, Butter and Skim Milk.	Cheese Yield, 4 Per Cent Milk (pounds)	Cheese, Cents, per Pound. Fresh, Average Run.	Value.	Value, Whey per cwt. of Whole Milk.	Total Value, Cheese and Whey.
4.64	71	\$3.29	\$1.12	\$4.41	10.60	37	\$3.92	\$0.25	\$4.17
"	70	3.25	1.10	4.35	"	36½	3.87	.25	4.12
"	69	3.20	1.08	4.28	"	36	3.82	.25	4.07
"	68	3.16	1.06	4.22	"	35½	3.76	.24	4.00
"	67	3.11	1.04	4.15	"	35	3.71	.24	3.95
"	66	3.06	1.02	4.08	"	34½	3.66	.24	3.90
"	65	3.02	1.00	4.02	"	34	3.61	.23	3.84
"	64	2.97	.98	3.95	"	33½	3.55	.23	3.78
"	63	2.92	.96	3.88	"	33	3.50	.23	3.73
"	62	2.88	.94	3.82	"	32½	3.45	.22	3.67
"	61	2.83	.92	3.75	"	32	3.40	.22	3.62
"	60	2.78	.90	3.68	"	31½	3.34	.22	3.56
"	59	2.73	.88	3.61	"	31	3.29	.21	3.50
"	58	2.69	.86	3.55	"	30½	3.24	.21	3.45
"	57	2.64	.84	3.48	"	30	3.18	.21	3.39
"	56	2.60	.82	3.42	"	29½	3.12	.20	3.32
"	55	2.55	.80	3.35	"	29	3.07	.20	3.27
"	54	2.51	.78	3.29	"	28½	3.02	.20	3.22
"	53	2.46	.76	3.22	"	28	2.96	.19	3.15
"	52	2.42	.74	3.15	"	27½	2.91	.19	3.10
"	51	2.37	.72	3.09	"	27	2.86	.19	3.05
"	50	2.32	.70	3.02	"	26½	2.81	.18	2.99
"	49	2.27	.68	2.95	"	26	2.75	.18	2.93
"	48	2.23	.66	2.89	"	25½	2.70	.18	2.88
"	47	2.18	.64	2.82	"	25	2.65	.17	2.82
"	46	2.13	.62	2.75	"	24½	2.60	.17	2.77
"	45	2.09	.60	2.69	"	24	2.54	.17	2.71
"	44	2.04	.58	2.62	"	23½	2.49	.16	2.65
"	43	2.00	.56	2.56	"	23	2.44	.16	2.60
"	42	1.95	.54	2.49	"	22½	2.39	.16	2.55
"	41	1.90	.52	2.42	"	22	2.33	.15	2.48
"	40	1.86	.50	2.36	"	21½	2.28	.15	2.43
"	39	1.81	.48	2.29	"	21	2.23	.15	2.38
"	38	1.76	.46	2.22	"	20½	2.17	.14	2.31
"	37	1.72	.44	2.16	"	20	2.12	.14	2.26
"	36	1.67	.42	2.09	"	19½	2.07	.14	2.21
"	35	1.62	.40	2.02	"	19	2.01	.13	2.14
"	34	1.57	.38	1.95	"	18½	1.96	.13	2.09
"	33	1.53	.36	1.89	"	18	1.91	.13	1.98
"	32	1.48	.34	1.82	"	17½	1.86	.12	1.92
"	31	1.44	.32	1.76	"	17	1.80	.12	1.87
"	30	1.39	.30	1.69	"	16½	1.75	.12	1.81
"	29	1.34	.28	1.62	"	16	1.70	.11	1.81
"	28	1.30	.26	1.56	"	15½	1.64	.11	1.75
"	27	1.25	.24	1.49	"	15	1.59	.11	1.70
"	26	1.20	.22	1.42	"	14½	1.54	.10	1.64
"	25	1.16	.20	1.36	"	14	1.48	.10	1.58

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TABLE B.—NEW YORK PLAN FOR BUYING WHOLE MILK BASED ON THE MARKET VALUES OF BUTTER AND CHEESE

Date.	New York Market Prices, Cents per Pound.		4 Per Cent Whole Milk, Value in		Average, 4 Per Cent Whole Milk Value In- cluding Average Costs of Manufacture, etc., of 34 Cents per 100 Pounds.	Adjustment for Conditions Peculiar to New York Territory.	Net Price 4 Per Cent Whole Milk.
	Butter, Fresh Extras.	Cheese, Fresh Average Run.	Butter.	Cheese.			
1918.							
January.....	52.2	23.3	\$3.17	\$2.63	\$2.90 ¹	+\$0.16	\$3.06 ¹
February.....	51.1	23.3	3.09	2.63	2.86 ¹	+ .16	3.02 ¹
March.....	44.5	23.4	2.66	2.64	2.65 ¹	+ .16	2.81 ¹
April.....	43.3	22.2	2.58	2.50	2.54	— .15	2.39
May.....	45.3	22.3	2.71	2.52	2.62	— .15	2.47
June.....	43.9	23.2	2.61	2.62	2.62	— .15	2.47
July.....	44.8	24.5	2.68	2.77	2.72	+ .16	2.88
August.....	46.0	25.7	2.75	2.90	2.83	+ .36	3.19
September.....	55.9	27.8	3.41	3.14	3.27	+ .36	3.63
October.....	58.7	32.2	3.59	3.63	3.61	+ .16	3.77
November.....	63.2	32.7	3.90	3.69	3.79	+ .16	3.95
December.....	68.6	36.0	4.26	4.07	4.16	+ .16	4.32
1919.							
January.....	61.8	35.5	3.80	4.00	3.90	+ .16	4.06
February.....	51.8	30.0	3.14	3.39	3.27	+ .16	3.43

pound for butter and $2\frac{3}{4}$ cents per pound for cheese, though we are advised the actual costs of manufacture and marketing are greater. Further, we have valued the skim milk and whey in 100 pounds of whole milk at the prices heretofore paid for 100 pounds of such by-products when butter

¹ In any comparison of values for the first three months of 1918 it must necessarily be borne in mind that due to the placing of embargoes on ocean traffic by the Government on account of having to use all available vessel space for troops, munitions, equipment, etc., supplies of butter and cheese, as well as other food products, intended for shipment to Europe, were unable to be moved, and due to overstocked markets values were demoralized. This created an abnormal situation, a repetition of which is most unlikely.

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and cheese sold at the figures shown in Table A, notwithstanding not more than 85 pounds of skim milk or 90 pounds of whey can be secured from 100 pounds of whole milk. We figure that all these allowances are equivalent to approximately 34 cents per 100 pounds of milk.

This plan recognizes the expense of producing milk in this territory by the addition of certain arbitraries; and likewise offsets the tendency toward an increased summer production by deductions in the three months April, May and June. The deductions so made taken into consideration in establishing the arbitraries added to subsequent months. (See Table B.)

The method of arriving at a price would be as follows:

The market values of butter and cheese would be ascertained from the "Producers' Price Current," an official report of transactions in butter, cheese and other commodities sold in New York markets, issued daily.

Take for illustration the month of December, 1918. Table B shows that the average price of 92 score butter for that month was 68.6 and cheese 36 cents per pound. The return of 4.64 pounds of butter at 68.6 cents per pound would be \$3.18 (actually \$3.18304), and Table A shows that the skim milk with butter at 68.6 cents per pound would have a value of \$1.072, making the total value of 100 pounds of 4 per cent milk on a butter basis of \$4.255. At 36 cents per pound Table A indicates that 10.6 pounds of cheese would have a value of \$3.82, and on this basis whey is valued at 25 cents, making a total value for cheese and whey of \$4.07, or an average value on a butter and cheese basis of \$4.16. To this would be added 16 cents

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as a further premium for meeting the costs of production and conditions peculiar to milk produced in this territory, making a total price, under this plan, for 100 pounds of 4 per cent milk in the month of December, 1918, of \$4.32.

Similarly, taking the month of June, 1918, as the price of butter was 43.9 cents and the price of cheese 23.2 cents, by figuring in just the same way as above, the value of 100 pounds of 4 per cent milk on a butter basis would be \$2.61 and on a cheese basis \$2.62, and the average of these would be \$2.62. June being one of the three flush months in which there would be a deduction of 15 cents, price for 100 pounds of 4 per cent milk would be \$2.47.

The basic price to be considered is milk testing 3.6 per cent butter fat. To ascertain such basic figure the price for 4 per cent milk as determined in accordance with plan is to be divided by 4 and multiplied by 3.6. The price of milk for tests other than 3.6 per cent to be arrived at by adding or deducting 4 cents per 100 lbs. for each one-tenth of one per cent of fat above or below 3.6 per cent as the case may be. Such basic price to be paid in the 200-210 mile freight zone, subject to the freight differentials above or below such basic zone, but with no deductions for freight zones above 400 miles.

As finally agreed upon, the price of whole milk for any month under the plan was based upon the average price of butter and cheese for the current month ending on the twentieth day. Thus the price for whole milk to be paid in May was based on the price of butter and cheese for the month ending

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on April 20th, and for October on the butter and cheese price for the month ending on September 20th.

One disadvantage of this plan lies in the fact that in the spring and summer months when the prices of butter and cheese are falling, the price for whole milk for the subsequent month may be above the price prevailing by that time for those commodities, and, conversely, in the autumn the prices thus established will tend to be below the prices of butter and cheese. In other words, under this plan the past is determining the price paid for milk while the prices presently received for milk products—as for any other commodity—is influenced also by the prospects for the future. Moreover, the price to an extent must always be above the actual market price during the months of maximum production and below the market price in the months of minimum production, depending upon the degree of fluctuation in butter and cheese prices. Moreover, the plan gives no basis for including the value of milk for whole milk consumption other than the stated differentials.

The plan is artificial. The differential to be added and subtracted as given in Table B is for the purpose of correcting this artificiality. But that this differential always fairly represents both prevailing producing and market facts no one would contend. Prices are determined by the present supplies and estimates of future demand and production. In the world of prices the past is a good guide, but it is not and cannot be the sole determinant in fixing prices.

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This plan after trial for one year was abandoned. The chart on page 156 gives the results in price to producers as compared with three other primary markets for the months it was tried.

The surplus price plans now in use in the Philadelphia and Baltimore markets are discussed in Chapter VII.

The manufactured products are the forms in which whole milk is economically stored during flush seasons against seasons of scarcity. The development of cold storage facilities and of more efficient methods for changing whole milk into forms that will keep, stabilizes the prices of dairy products to the consumer and provides the summer producer a larger and better market. Butter and cheese have usually been made in localities where transportation to market has been poor, and hence where milk would spoil if it were shipped for use in its fresh state. This is as true of the old household industry that turned out butter and cheese, as of the newer factory industry that has sprung up in the last half century. Also, countries with a surplus of milk for the needs of their population have, with the right kind of farmers' associations and marketing organization, turned to the export of butter and cheese. Holland and Denmark are striking examples of such countries.

It is through the manufactured products, too, that milk solids produced in one country or one section of a large country are made available to other countries and to all sections of the same country. During the war years the demand of other countries

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for our dairy products opened a market never before in the reach of our dairymen, on a profitable basis, with its inevitable result upon prices for dairy products not only in this country but in all countries. The quantities and values of our exports and imports and the output in this country are summarized in the succeeding chapter, where the interrelation of international, national and local demand and supply and their effect on the price of dairy products is discussed.

A comparatively new method of changing the form of milk so that it will not spoil, is to make it into condensed or evaporated milk or milk powders. Condensed milk, it is true, has been found to have a limited market. A large portion of the population does not find in it an entirely adequate substitute for fresh milk. But notwithstanding these limitations, there is a large and permanent market for the product. Not only is the domestic market available, but there is also an expanding market in tropical or frigid countries and in countries not adapted to milk production.

The following table shows the relative amounts of each of the different grades of condensed and evaporated milk produced in the United States in 1916, 1917, 1918, and 1919. We are saving more of our skimmed milk. The percentage of increase in the use of imported animal and vegetable oils is suggestive of the increase in substitutes for butter with a relative decline in the production of butter, as discussed on page 74.

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PRODUCTION OF CONDENSED AND EVAPORATED MILK IN THE UNITED STATES FROM WHOLE MILK, 1916-1919

(Figures are in round thousands of lbs., i. e., 000 omitted)

Year	Condensed Milk.			Evaporated Milk.			Total Condensed and Evaporated.	Per Cent Increase over Previous Years.
	Case.	Bulk.	Total.	Case.	Bulk.	Total.		
1916....	267,307	20,767	288,073	524,273	106,939	631,212	919,285	..
1917....	280,958	34,658	315,616	741,559	186,609	928,168	1,243,784	35
1918....	411,225	40,872	452,097	916,438	183,612	1,100,050	1,552,147	25
1919....	573,044	38,394	611,437	1,194,496	77,514	1,272,010	1,883,447	21

FROM SKIM MILK

1916....	9,757	32,993	42,749	3,526	26,704	30,230	73,079	..
1917....	7,832	41,235	49,067	8,586	32,348	40,935	90,002	23
1918....	8,653	46,303	54,957	12,049	56,782	68,831	123,787	38
1919....	7,468	65,377	72,845	3,626	71,039	74,665	147,510	19

FROM PART OR FULL SKIMMED MILK MODIFIED WITH FOREIGN FAT

Year.	Case (pounds).	Bulk (pounds).	Total (pounds).	Increase over Previous Years (per cent).
1916.....	12,000	14,134,712	14,146,712	..
1917.....	18,504	17,487,064	17,505,568	24
1918.....	41,033,855	7,591,182	48,625,037	178
1919.....	62,262,221	2,748,120	65,010,341	34

Continued on next page.

Chart No. IX on page 70 gives the monthly variations in the wholesale price of extra creamery butter and whole milk cheese from 1913 to 1919 inclusive. The prices taken are the average for the month. It will be noted: (1) Monthly and seasonal price fluctuations for cheese are not as great as for

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TOTAL PRODUCTION OF CONDENSED AND EVAPORATED MILK (cont'd)

(Figures are in round thousands of lbs., i. e., 000 omitted.)

Year.	From Whole and Skim Milk (pounds).	Increase over Previous Years (per cent).	Relative Increase over 1916 (per cent).	Including Foreign Fat (pounds).	Increase over Previous Years (per cent).	Relative Increase over 1916 (per cent).	Percentage of Foreign Fat of Total Production.
1916	992,364,000	..	100	1,006,510,712	..	100	0.014
1917	1,333,786,000	34	134	1,351,391,568	34	134	0.012
1918	1,675,934,999	25	168	1,724,559,037	27	170	0.028
1919	2,030,957,000	21	204	2,095,967,341	21	208	0.031

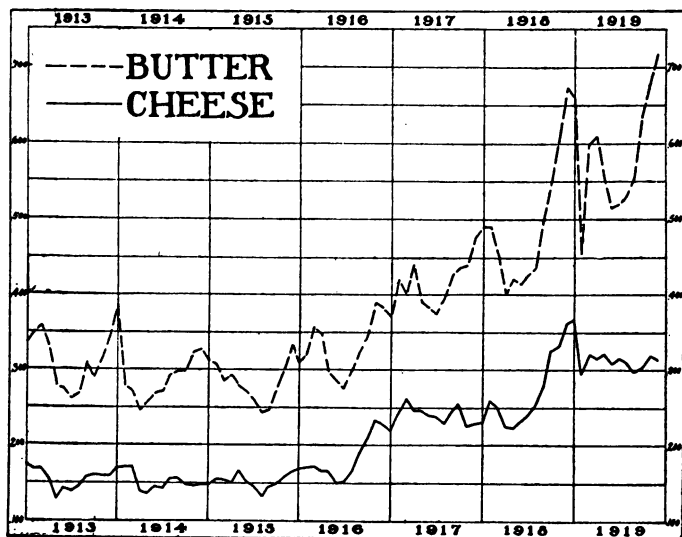
butter. (2) High and low price months vary from year to year and are not always the same months for both butter and cheese. (3) The price for one product affects in general but not proportionally nor immediately the price of the other. While the average between the lowest price at which butter and cheese went into storage and the highest price at which they came out was 14.3 and 6.2 cents per pound respectively for this seven-year period, the monthly variations in these differentials (and hence in profits and risks) were marked. (4) The margins were larger after we entered the war than in the pre-war period. Thus the margin for butter in 1918 was three times what it was in 1919.

These facts are brought out in the table on page 71 showing the lowest and highest average monthly prices for each of these years for butter and cheese,

THE PRICE OF MILK

and the margin between the highest and the lowest prices on these products for each year.

CHART No. IX.—AVERAGE MONTHLY WHOLESALE PRICES OF BUTTER¹ AND CHEESE, 1913-1919



The placing of butter in cold storage begins in the United States about April 1st in ordinary years and extends through August into September. The storage of butter preserves its quality as well as stabilizes price. Statistics of the cold-storage holdings of butter in 1914 indicate that approximately 18 per cent of the butter placed in cold storage is received

¹ The quotations taken are the average wholesale prices for extra-creamery butter at Chicago and whole milk cheese at New York City. The quotations on cheese were taken for New York because not available for 1913 on Chicago market.

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MONTHS OF HIGH AND LOW PRICES ON BUTTER AND CHEESE, AND MARGINS, 1913-1919

BUTTER

Year.	Lowest Price.		Highest Price.		Margin per Pound.
	Month.	Price per Pound.	Month.	Price per Pound.	
1913.....	July	\$0.262	December	\$0.346	\$0.084
1914.....	April	.245	January	.385	.140
1915.....	August	.243	December	.333	.090
1916.....	July	.275	November	.388	.113
1917.....	July	.375	December	.475	.100
1918.....	April	.400	December	.673	.273
1919.....	June	.515	December	.718	.203

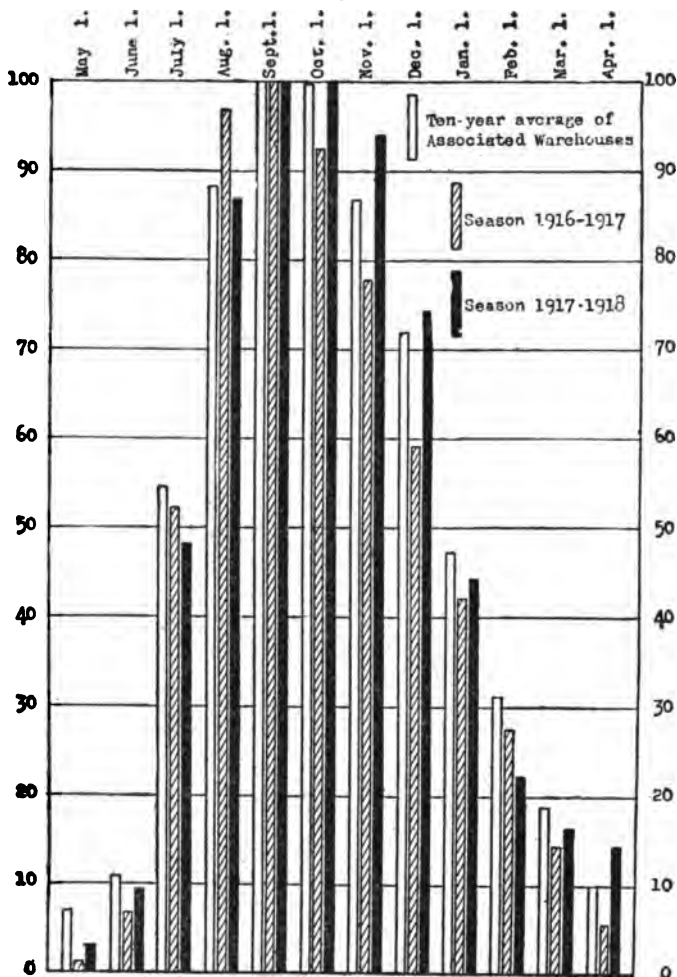
CHEESE

1913.....	July	.139	January	.173	.034
1914.....	April	.138	March	.171	.033
1915.....	August	.132	December	.164	.032
1916.....	June	.150	November	.233	.083
1917.....	January	.220	March	.261	.041
1918.....	May	.223	December	.263	.140
1919.....	February	.295	February	.368	.073

into storage in May, 33 per cent in June, 23 per cent in July and 7 per cent in August. During these four months 81 per cent of the butter stored is delivered into storage. In 1917, 78 per cent of the total butter in storage went in during the months of June and July. Deliveries out of storage were more gradual, approximately 11 per cent being removed in August, 8 per cent in September, 9 per cent in October, 12 per cent in November, 15 per cent in December, 11 per cent in January, 9 per cent in

CHART NO. X.¹—COLD STORAGE HOLDINGS OF CREAMERY BUTTER BY MONTHS FOR STATED PERIODS

Base—100—Holdings on September 1st)



¹ Chart from p. 9, Bulletin No. 776, United States Department of Agriculture, March, 1919.

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February, 11 per cent in March and 5 per cent in April. The deliveries out of storage during each of eight months (September to April, inclusive) exceed the receipts into storage, therefore the period of storage for separate lots is variable. The average length of storage is approximately 6.2 months.

The chart on the opposite page pictures the seasonal variation in the flow of creamery butter into and out of cold storage for (1) the ten-year average (1907-1916 inclusive) of associated warehouses and for the seasons of (2) 1916-1917 and (3) of 1917-1918.

The differences in price for butter and cheese between summer and winter reflects to a large extent the difference between the price to the farmer for whole milk in summer and in winter. In other words, so far as butter influences the prices received for whole milk in winter, it tends to keep that price down to a point representing the cost of storing butter for six months plus the added difference people will pay to get fresh butter instead of cold storage butter. The price for fresh butter usually runs about ten cents per pound above the price for cold storage butter.

To store butter many cold storage companies charged before the war $12\frac{1}{2}$ cents per cwt. per month for less than carload lots, 10 cents per cwt. per month for carload lots, and 25 cents per cwt. per month for small lots stored for thirty days or less. The customary rate with small storages was one-fourth of a cent per pound per month. The approx-

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imate costs for interest storage and insurance for holding butter in cold storage for six months were estimated at pre-war prices as:

Interest on 100 pounds butter at 28 cents for six months at 6 per cent.	\$0.84
Storage on 100 pounds butter at 10 cents per cwt. per month for six months. ....	.60
Insurance at rate of 42 cents per \$100 for six months. ....	.1175
<hr/>	
Cost per 100 pounds for six months.	\$1.5576
Cost per 100 pounds for one month. ....	.2596

These costs can readily be re-figured on present day prices.

It was estimated in October of 1918 that the people of the United States were consuming monthly 60,000,000 pounds of creamery butter, 20,000,000 pounds of margarin, 1,500,000 pounds of process butter, and 500,000 pounds of whey butter, a total of 82,000,000 pounds. It was estimated that these 82,000,000 pounds of butter and butter substitutes were consumed by 35,000,000 people, the remainder of the population either using farm-made butter or being too young to consume butter. This is a consumption of $2\frac{1}{2}$ pounds per month per person, or $\frac{5}{12}$ of an ounce per meal. About one-fourth of this consumption consists of substitutes for butter. These substitutes at that time were priced 34 to 35 cents per pound as compared with 54 to 53 cents per pound for storage butter and 70 cents for fresh butter.

In 1912 butter constituted 40 per cent of the total fat production in the United States, but in 1917 it

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was only 27 per cent of the total. In 1912, vegetable oils formed but 35 per cent of the fat produced and animal fats other than butter 25 per cent; by 1917 the fats produced from these sources had increased to 42 per cent and 31 per cent respectively.

TOTAL PRODUCTION OF FATS AND OILS IN THE UNITED STATES¹

Product.	1912 (pounds).	1914 (pounds).	1916 (pounds).	1917 (pounds).
Vegetable oils ⁴	1,966,613,000	2,338,185,000	2,236,507,000	2,159,335,000
Animal fats ⁵	1,351,867,000	1,596,157,000	1,898,774,000	1,636,451,000
Total	3,318,480,000	3,934,342,000	4,135,281,000	3,795,786,000
Butter ⁶ (farm)	1,660,000,000	1,613,736,000	879,610,000	733,222,000
Butter ⁶ (factory)	581,000,000 ⁷	652,382,000	609,398,000	636,278,000
Total	2,241,000,000	2,266,118,000	1,489,008,000	1,369,500,000
Grand total	5,559,480,000	6,200,460,000	5,624,289,000	5,165,286,000

And this increase in the use of substitutes for butter has been accompanied by a decrease in the per capita production of butter and cheese.

¹ The figures given in this table were compiled by the Fats and Oils Division of the United States Food Administration from a careful survey made during 1917 and 1918. P. 3, Bulletin No. 769, United States Department of Agriculture, February, 1919.

² These figures represent the average butter fat content of butter, or 83 per cent of the total butter produced.

³ Estimated.

⁴ *Vegetable oils* include castor, cocoanut, coquits, corn, cottonseed, grapeseed, linseed, mustard seed, olive, palm kernel, peanut, rapeseed, sesame, shea nut, soy bean, sunflower seed, all other vegetable oils.

⁵ *Animal fats* include, bone grease, cod and cod liver oil, garbage grease, herring oil, lard, menhaden oil, miscellaneous oils, neat's foot oil, neutral lard, oleo stock, packers' and renderers' greases, sperm oil, tallow, whale oil, wool grease and recovered grease, all other fish oils.

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PER CAPITA PRODUCTION OF BUTTER AND CHEESE, 1870-1919

Year.	Population.	Production of Butter ¹ (pounds).	Per Capita Production (pounds).	Production of Cheese (pounds).	Per Capita Production (pounds).
1870.....	28,558,371	514,092,683	13.3	162,927,382	4.2
1880.....	50,155,783	806,672,071	16.1	243,157,850	4.8
1890.....	62,947,714	1,305,446,606	19.1	256,749,383	4.1
1900.....	75,994,575	1,491,752,602	19.6	298,344,639	3.9
1910.....	91,972,266	1,619,415,263	17.6	320,532,181	3.5
1919.....	106,352,191	1,549,000,000	14.5	378,000,000	2.4

The table on the next page gives the average annual wholesale prices of the vegetable and animal fats competing with butter from 1913 to 1918, with the percentage of increase in the wholesale price of each for 1918 over 1913. Butter increased 59 per cent as compared with 175 per cent in cottonseed oil, 196 per cent in corn oil and 157 per cent in lard. Butter increased the least of any except cocoanut oil. The great bulk of cottonseed, corn and peanut oils are used for food. Cottonseed oil is used especially for lard substitutes and for oleomargarin. One-half of the available supply of cocoanut and soya bean oils are used in making soap.²

Producers of the different animal and vegetable fats have been competing in price for markets. Butter, as a consequence, did not increase in price as rapidly as did its substitutes. On page 92 it is pointed out that the imports for the substitutes for

¹ From Statistical Abstract for year preceding decennial year.

² It is interesting to note here in passing that the average annual wholesale price of Ivory Soap increased 218 per cent from 1913 to 1918 and the size of the bar decreased from time to time in the bargain. The price per box was \$3.11 in 1913 as compared with \$9.91 in 1918.

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butter increased from about 1,000,000 pounds in 1913 to 4,000,000 pounds in 1919, and on page 68 that the percentage of condensed or evaporated skim milk modified with foreign fat increased from 1.4 per cent of the total evaporated and condensed milk produced in this country in 1916 to 3.1 per cent in 1919.

**THE AVERAGE ANNUAL WHOLESALE PRICES BY YEARS OF
VEGETABLE AND ANIMAL FATS COMPETING WITH
BUTTER, AND THE PERCENTAGE OF
INCREASE IN EACH FOR 1918
OVER 1913**

Year.	Cotton- seed Oil, per Pound.	Cocoa- nut Oil, per Pound.	Lard Substi- tutes, per Pound.	Corn Oil, per Barrel.	Butter, Cream- ery Extra, per Pound.	Oleomargarine per Pound.	Soya Bean Oil, per Pound.	Tallow, per Pound.
1913.....	\$0.0725	\$0.1199	\$0.0876	\$0.0607	\$0.3104	\$0.1775	\$0.0612	\$0.0634
1914.....	.0663	.1220	.0828	.0617	.2873	.1758	.0630	.0635
1915.....	.0681	.1231	.0821	.0630	.2836	.1733	.0625	.0633
1916.....	.1064	.1513	.1275	.0960	.3254	.1917	.0891	.0927
1917.....	.1535	.1706	.1779	.1452	.4111	.2700	.1421	.1486
1918.....	.1992	.1810	.2257	.1803	.4946	.3100	.1828	.1713
Per Cent Increase, 1918 over 1913.	175	50	157	196	59	74	198	170

The production of oleomargarin in the United States increased 72 per cent from 1918 to 1919. During this year our production of butter increased but 4 per cent. The production of oleomargarin during these two years was from the following sources:

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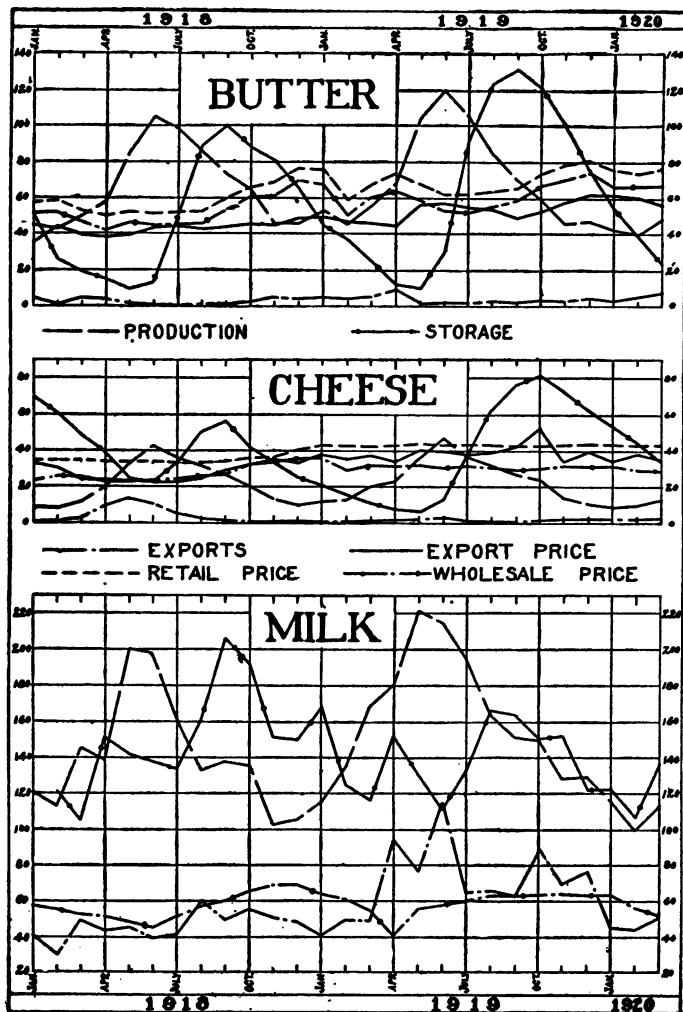
PRODUCTION OF OLEOMARGARIN (POUNDS)

	1918.	1919.
Oleomargarin (uncolored), animal and vegetable oil	255,196,592	214,750,680
Oleomargarin (uncolored), exclusively vegetable oil	88,861,472	132,906,154
Oleomargarin (uncolored), exclusively animal oil	3,306,671	3,391,206
Oleomargarin (colored), animal and vegetable oil	7,056,442	9,302,681
Oleomargarin (colored), exclusively vegetable oil	112,494	9,792,694
Oleomargarin (colored), exclusively animal oil	1,002,864	1,165,362
Total	215,536,535	371,317,786

Chart No. XI shows by months the relationship between the amount of butter, of cheese and of condensed and evaporated milk produced in this country, the quantities of butter and cheese in storage, the stock of condensed and evaporated milk on hand, the quantities of each of these three products exported, the average price received for all grades of butter and of cheese exported, the wholesale price of extra creamery butter, of American cheese and (per case, 16-oz. cans) of condensed milk, all at New York City. The domestic retail price for butter and cheese is taken for New York City. Production, stocks on hand and in storage, and quantities exported ought to be the chief factors in measuring the effect of domestic and foreign supply and demand upon prices.

A few of the points to be gleaned from the chart are: 1. Exports are relatively not a large proportion of the total production of butter and cheese, but are of condensed and evaporated milk. 2. The seasonal fluctuations in the wholesale prices for these three

CHART NO. XI.—THE RELATION OF PRICES TO PRODUCTION,
EXPORTS AND STORAGE STOCKS OF BUTTER, OF CHEESE
AND OF CONDENSED MILK AND EVAPORATED MILK
(Prices are in Cents per Pound. Quantities are in Millions of
Pounds. (For sources see page 84.)



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products for this period were most marked for butter, less for condensed milk and but little for cheese.

3. Seasonal production, however, varied most for cheese, less for butter and least for condensed milk, and neither high nor low production were in the same months. The lowest production of cheese was 8,500,000 pounds in February of 1918; the highest production, 47,000,000 pounds in June of 1919. Butter production was lowest (42,300,000 pounds) in February of 1918 and highest (119,300,000 pounds) in June of the next year. The low production month (102,000,000 pounds) for condensed and evaporated milk was November of 1918, the high month (221,000,000 pounds) in the following May.

4. The wholesale price for these three products were lowest and highest in the following months: Butter, April, 1918 (4.15), and December, 1919 (7.35); cheese, April, 1918 (2.25), and January, 1919 (3.68); condensed and evaporated milk, June (4.50) and December (6.87) of 1918.

5. The high and low months for storage stocks were: Butter, May, 1918 (9,500,000 pounds), and September, 1919 (131,000,000 pounds); cheese, June, 1918 (22,000,000 pounds), and October, 1919 (81,000,000 pounds); condensed and evaporated milk (stocks on hand), March, 1918 (105,000,000 pounds), and January, 1918 (515,000,000 pounds).

6. The quantities exported reached their lowest and highest in August, 1918 (337,000 pounds), and April, 1919 (8,400,000 pounds), for butter; in October, 1918 (549,000 pounds), and in May, 1918 (13,000,000 pounds), for cheese; and in February (29,000,000

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pounds) and June, 1919 (114,000,000 pounds), for condensed milk. 7. Storage stocks increased as prices went down. 8. The retail price of butter and cheese responded promptly in this period to rises and declines in wholesale prices.

An example of the effect of changes in demand is shown in the trend of prices following January of 1918. In that month stocks of condensed and evaporated milks reached the unprecedented total of 515,000,000 pounds. In the early days of 1918 the success of German submarines and the adoption of the military program that won the war made it impossible to get the cargo space to export either the quantities of case goods needed or available. Consequently stocks were higher in July of 1918 than in July of 1917 and prices of milk to the farmer in this country had to be reduced. Beginning with July of 1918, however, case goods, as did butter and cheese, moved more rapidly and prices to the farmer rose again, only to fall after the beginning of 1919, because the civil marketing channels of Europe had not as yet begun to absorb our dairy products in proportion to the demand that had been made by the military authorities.

Shortly after the armistice came closer buying by consumers because of the outlook for unemployment. Butter exports did not move as rapidly as in preceding months. The price to the farmers had gone up in the autumn of 1918 to unprecedented heights. People would not consume butter in usual quantities at the prevailing prices and the consump-

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tion of butter substitutes went up because cheaper. The result was that in the early months of 1919 the retail price of butter dropped ahead of the wholesale price and as much fresh butter was going into cold storage as was being taken out. The outlook did not promise any change and hence butter prices first and then prices for milk to the farmer went down in the early months of 1919, though feed and labor costs were higher than ever before.

The effect of dried milk powders upon the maximum price to dairymen selling on the whole milk market is discussed in the succeeding chapter. It remains here to point out the relation between the use of ice cream and the price of whole milk to the dairyman.

There was a time when the making of ice cream was almost exclusively a household industry. But the growing popularity of this food has tended to concentrate its manufacture in large plants on a commercial basis. This has standardized its composition and rendered its quality uniform, which in turn has increased the appetite for it. Because of the chemistry of ice cream manufacture, large scale production has developed economies which have kept prices down and made the product available to all. Many a fortune has been made through the integration of small milk manufacturing industries; and a wider market has been opened to the producer, a market that in price possibilities ranks second only to that of milk for whole milk consumption. We manufactured 122,900,106 gallons of ice cream in this country in 1918 and 127,840,204 gallons in 1919.

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But it is not profitable commercially to manufacture ice cream entirely out of whole milk and cream. To the butter fat solids in cream, the milk solids not fat are added from condensed skim milk or from milk powders. Inasmuch as cream can be kept in cold storage for at least six months without a material increase in the bacteria count (if sweetened as required for ice cream it can be kept much longer), and since milk solids in manufactured form can be kept indefinitely, the making of ice cream in the average dairy section becomes a question of the most economical use of storage products with regard to the whole milk supply of the moment. It does not pay to use fresh milk and cream at prices much above the price of the storage products. Moreover, ice cream itself can be stored for a week or two, though it deteriorates in quality. Ice cream may be made in New York City from condensed skim milk from Seattle, cream from Wisconsin, salt from Kansas and ice from Maine. It is in no sense now necessarily a local product. The output of the best dairy regions the world over determine the price of its constituent milk elements.

Ice cream is not alone a sufficient outlet for the surplus of the whole milk dealer. The maximum of milk production comes in June, the maximum of ice cream production in July or August. Indeed, if August be dry and hot and the flies bad, milk production may go down as rapidly as ice cream consumption goes up. One or more of the other methods of manufacturing milk products must be used to

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consume economically the milk received by a distributor in excess of his needs for the whole milk trade.

In 1918 a new machine was successfully put on the market in considerable quantities by means of which the "cream" for ice cream could be made by homogenizing sweet butter and skim milk powders in proper proportions with water. By this process the mixture was emulsified and the ingredients thoroughly blended into a product of the much desired "velvety" consistency. The result is that the small ice cream parlor can now keep the ingredients for ice cream on its shelves and use just the portion needed, thus giving the small manufacturer an opportunity in competition with the large and, by increasing the use of manufactured milk products, decrease the necessary seasonal dependence upon whole milk and cream. This process, however, has not proved sufficiently economical and practical to affect the tendency toward large scale manufacture of ice cream.

The making of whole milk from sweet butter and skimmed milk powders is discussed in Chapter VII.

In these and other ways will one use of whole milk affect the price of another use of whole milk. The price forces at work are each mobile and powerful, yet responsive one to the other.

The production statistics and storage stocks for Chart No. XI are compiled from the monthly production reports of the United States Bureau of Markets, the exports and export prices from the Monthly Summary of Foreign Commerce of the United States, and the wholesale and retail prices from the Bureau of Labor Statistics.

CHAPTER IV

The Price Interdependence of Local Primary and International Markets

The competition between dairying areas in different countries has been named as one of the factors strongly influencing the price of milk.

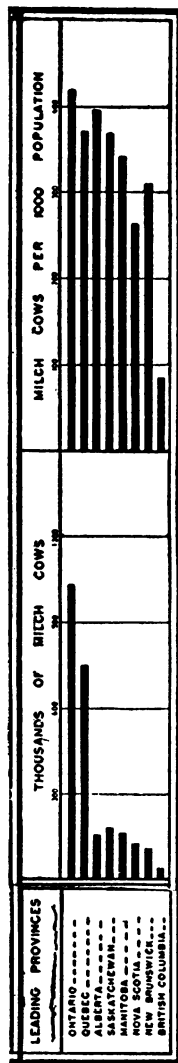
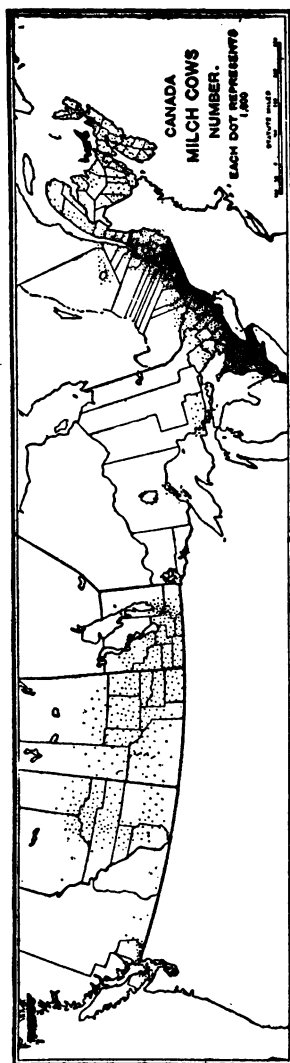
The map and chart facing page 86 depict the total number of milk cows, the number per square mile, and the number per 1000 population, preceding the war, in the United Kingdom, Sweden, Austria-Hungary, France and the German Empire.

The distribution of milk cows in Canada, the total number, and the number per 1000 population for the provinces notable for the production of dairy products is given in the map on page 86.

Facing page 94 is a map showing the distribution of dairy cows in the United States, together with a chart showing the relative number of animals, the percentage of all farms reporting milk cows and the value per animal in dollars for the ten leading dairy states and for the United States as a whole, for the year 1910.

The world's greatest dairying areas are (1) the region along the northwest coast of Europe where climatic conditions favor rich pastures, (2) northern Italy, (3) in the United States the so-called Elgin district in northern Illinois and the adjoining counties of southern Wisconsin, with a scarcely less important

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THE DISTRIBUTION OF MILK COWS IN CANADA¹

¹ Geography of the World's Agriculture, U. S. Dept. of Agri., 1917.

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center in central New York and northwestern Vermont, and (4) the St. Lawrence lowlands and the peninsula of Ontario in Canada. The intensive dairy districts in northern Italy and along the northern coast of France, the Netherlands and Denmark have from two to three times as many cows per square mile as the densest dairy regions in the United States.

Why these dairy regions are where they are is a fact pertinent to price. It is because of low production costs in the first place and because of nearness to markets in the second. There are of course other reasons such as reputation for a special dairy product. Denmark's reputation for butter causes most of her milk supply to go into butter, "while the Netherlands with somewhat better climatic conditions and transportation facilities converts a considerable portion of her milk supply into cheese, for which a reputation has been established," say the authors of the *Geography of the World's Agriculture*. But in general the dairy industry of northern Europe flourishes because of favorable conditions of grass production and proximity to large markets. Pasture and dairying are even more closely connected in Europe than in the United States. In Germany, butter is produced in the northern lowlands and cheese in the rough southern hill sections, especially in Bavaria. In Great Britain about 70 per cent of the milk produced is consumed as whole milk, and in Germany about 43 per cent¹ as compared with

¹ *Geography of the World's Agriculture*, U. S. Dept. of Agri., 1917, p. 119.

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43.1 per cent in the United States and 27 per cent in Canada, on pre-war standards. The dairy industry in the Mediterranean countries is relatively unimportant. In Greece there are "not more than 4000 cows, mainly near Athens." The irrigated hay regions of the Italian Alps and the Po Valley are important dairy regions.

The sections of large milk production in the United States, noted above, are in areas where the cool summer climate favors the production of dairy products of high qualities, and where the best use of corn is for silage. The climatic conditions and rainfall make good pasture and hay, the most profitable market for which is in dairy products. Another milk area lies in the cool clay soils of northern Ohio, from which comes the largest share of the milk for the Pittsburgh and Cleveland markets. The butter producing area in northwestern Vermont lies in land adapted to spring and summer butter production rather than to any other use.

These areas, peculiarly fitted for dairy farming, are competing for the world's best markets in storage dairy products.

During the war period the scarcity of dairy feeds, especially the concentrates, caused a decline in the herds of the European countries. The number of dairy cows in Great Britain decreased by 1.7 per cent from 1914 to June 30, 1918, the number on the latter date being 4,548,000. The number of dairy cows in France decreased from 7,794,270 on December 31, 1914, to 6,238,690 on June 30, 1917, a decrease of

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around 20 per cent. The dairy herds in Italy decreased during the war about 14 per cent. The facts as to enemy countries are not now available. But we do know that the supply of whole milk for Berlin was 220,000 liters in June of 1919, as compared with 400,000 liters in July, 1917. Germany now has but four-fifths of the milk cows she had before the war. Because the dairy cows not killed were poorly fed, the total output of the dairy herds in these warring countries decreased more rapidly than the numbers. Moreover, it may take considerable time, at good feeding, to get these herds back to normal. Until they are back to normal, the United States can expect to supply Europe with decreasing amounts of dairy products. To the extent, however, that European herds in the future may rely on feeds imported from the United States, it would be cheaper to transport dairy products to Europe than it would be to transport feeds. Wages of laborers and standards of living on American and European farms will determine whether our nation is to be the greatest dairy area of the world.

These conditions in Europe gave to our producers during the war period a large and expanding market for our dairy products.

We exported over nine times as much butter and cheese in 1919 as in 1913 and about forty-five times as much condensed milk. From 1908 to 1919 we exported more butter than we imported, save for 1914. In 1880 the United States was the greatest cheese-exporting country in the world. In 1918

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five countries each exceeded the United States in cheese exports. Just before the war we were consuming all the cheese we produced and importing one-tenth of the exports from all countries.¹

The net balance of trade in dairy products (1913-1919) has been well presented by the Dairy Division of the United States Department of Agriculture in Chart No. XII. In this chart the differences between exports and imports has been expressed in terms of whole milk for butter, cheese and condensed milk, assuming 21, 10 and 2½ pounds of whole milk, respectively, to one pound of butter, cheese and condensed milk. The term "condensed milk" includes evaporated and skim condensed milk. The year 1913 was normal for pre-war times. Our production was low in 1914.

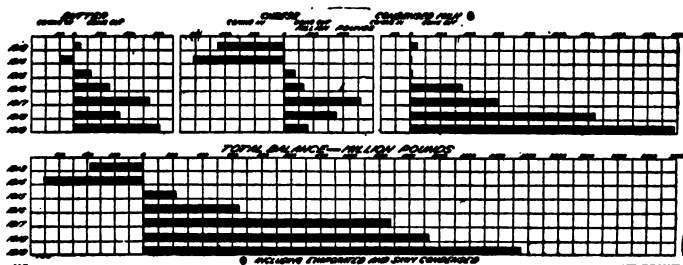


CHART NO. XII.—BALANCE OF TRADE IN DAIRY PRODUCTS,
UNITED STATES, 1913-1919²

(In Terms of Whole Milk)

¹ See "Trend of the Cheese Industry", United States Department of Agriculture, Circular No. 71, November, 1919.

² Year ending June 30th.

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EXPORTS, IMPORTS AND BALANCE OF TRADE IN POUNDS IN BUTTER AND CHEESE AND EXPORTS OF CONDENSED MILK, 1908-1919

BUTTER.

Year.	Exports.	Imports.	Balance of Trade
1908.....	6,463,061	780,608	5,682,453
1909.....	5,981,265	646,320	5,334,945
1910.....	3,140,545	1,360,245	1,780,300
1911.....	4,877,797	1,007,826	3,869,971
1912.....	6,092,235	1,025,668	5,066,567
1913.....	3,585,600	1,162,253	2,423,347
1914.....	3,693,597	7,842,022	-4,148,425 ¹
1915.....	9,850,704	3,828,227	6,022,477
1916.....	13,487,481	712,998	12,774,483
1917.....	26,835,092	523,573	26,311,519
1918.....	17,735,966	1,806,925	15,930,041
1919.....	33,739,960	4,131,469	29,608,491

Year.	CHEESE.			CONDENSED MILK. ²
	Exports.	Imports.	Balance of Trade.	Exports.
1908.....	8,439,031	32,530,830	-24,091,799 ¹	.....
1909.....	6,822,842	35,548,143	-28,725,301 ¹	.....
1910.....	2,846,709	40,817,524	-37,970,815 ¹	13,311,318
1911.....	10,366,605	45,568,797	-35,202,192 ¹	12,180,445
1912.....	6,337,559	46,542,007	-40,205,448 ¹	20,642,738
1913.....	2,599,058	49,387,944	-46,788,886 ¹	16,525,918
1914.....	2,427,577	63,784,313	-61,356,736 ¹	16,209,082
1915.....	55,362,917	50,138,520	5,224,397	37,235,627
1916.....	44,394,301	30,087,999	14,306,302	159,577,620
1917.....	66,050,013	14,481,514	51,568,499	259,141,231
1918.....	44,303,076	9,839,305	34,463,771	528,759,282
1919.....	18,794,853	2,442,306	16,352,547	728,740,509

¹ Imports exceeded exports.

² Includes evaporated and condensed skim milk. In 1919 there were imported 20,183,723 pounds of condensed milk. In 1918, 2,591,553 gallons of fresh milk were imported.

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These large exports are compared with production and storage stocks in their relation to price in the chart on page 79. Their effect was in large part offset by the increase in the production of substitutes for butter as shown on page 78. Not only did domestic production of butter substitutes increase as the price of dairy products advanced, but imports of those substitutes also increased in 1919 over any previous year since 1908 except the year 1914.

IMPORTS OF SUBSTITUTES FOR BUTTER AND CHEESE, 1908-1919

For Year Ending June 30th.	Substitutes for Butter (pounds).	Substitutes for Cheese (pounds).
1908.....	790,608	32,530,830
1909.....	646,320	35,548,143
1910.....	1,360,245	40,817,524
1911.....	1,007,826	45,568,797
1912.....	1,025,668	46,542,007
1913.....	1,162,253	49,387,944
1914.....	7,842,022	63,784,313
1915.....	3,828,227	50,138,520
1916.....	712,998	30,087,999
1917.....	523,573	14,481,514
1918.....	1,805,925	9,839,306
1919.....	4,131,469	2,442,306

By saving milk otherwise wasted on the farm or in the plant, by conserving and by increasing production, we changed from an importing to an exporting country.

Our dairymen can keep these foreign markets only if the wages paid to industrial populations in other countries will allow the wage earners of those coun-

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tries to buy our dairy products at prices satisfactory to the living standard of producers in our dairy regions. Since the freight on dairy products is less than on feeds, those who have an abundance of feeds close at hand ought to compete certainly with dairy regions which must import feeds, provided, however, that milk can be produced as economically in the favorable areas in this country as in areas specially adapted to dairying in other countries. Under modern transportation facilities nearness of market is not so vital in international price competition as climatic and soil conditions on the one hand, and land values, due to other alternatives, and to agricultural wages and living standards, on the other hand. An international movement to raise the living standards of farmers in those milk producing regions where living standards are lowest concerns the welfare of milk producers everywhere. Otherwise, milk producers in countries of high living standards will find themselves under the increasing necessity of competing with low standard labor as the rivalry for world markets intensifies.

An examination of the map facing page 93 showing the distribution of dairy cattle in the United States and of the map on page 26 showing the receipts from the sale of dairy products will reveal that there are in this country about nine important primary milk markets: Chicago, New York, Boston, Philadelphia, Pittsburgh (including Cleveland), Seattle, San Francisco, Detroit, and Louisville, Ky. There are no exact boundaries between these markets, but

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each is sufficiently distinct to have its own climatic, soil and marketing conditions and producing habits. The rather uniform distribution of cows in other parts of the United States indicates that they are kept primarily to supply domestic and local needs. In these nine primary market regions milk is produced far beyond domestic and local needs.

Outside the seasons of surplus production, the price to the producer for the milk sold for whole milk purposes in each of these primary markets will vary more or less from the price in other primary markets. To a certain extent the seasonal fluctuation in price will also vary from year to year in any one of these markets. For instance, the spring starts earlier and the frosts somewhat later in the Philadelphia district than in the New York district. The clay soil of northern Ohio is preëminently suited to dairying, while other farm products compete with dairying in the blue grass region surrounding Louisville. The long rainy season of the Seattle region with grass practically the year round is quite in contrast to the butter producing hill regions of Vermont with its long winters. The Elgin dairy region is close to the large corn and wheat market in Chicago, while the dairy region in New York State is far from a surplus corn and wheat area. As between each of these primary market areas there must be a variation in price that will reflect differentials in producing and seasonal conditions, and transportation costs.

Inasmuch as all these leading production areas

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have at hand a considerable industrial population, the price for milk for whole milk consumption will also vary in the different seasons, depending upon many factors peculiar to each market. One factor is the price that has to be paid to attract milk from butter and other milk factories into the whole milk market. How much this price must be above the butter or cheese market depends upon the rapidity of growth of city populations as compared with the increase or decrease in the local output of milk. For there is a limit to the distance whole milk can regularly be transported to market, although this distance has been rapidly increasing with better refrigeration and transportation facilities. Then again, the weather in one area will be more or less conducive to milk production than in another area. Or in the same market, one winter may be forbidding, another winter inviting to milk production; one summer too dry for pasture, another too wet for corn.

Therefore the price for whole milk within each of these larger primary markets, during the months when most of the milk produced must go into whole milk consumption, must and will vary from market to market. National price uniformity during these months is, therefore, not to be expected, nor desired, and if attempted must fail. It is only when the price in one market is so low or so high as compared with the near-by primary markets as to tempt milk distributors to put in permanent investments in receiving stations in these other markets or to plan

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to buy permanently from those other markets, that the price in one primary market begins to affect the price in near-by primary markets.

In seasons when the supply of milk in the primary markets does not exceed the demand for whole milk consumption, the supply devoted to the manufacture of milk products will flow into whole milk markets, if the price offered is enough above the prevailing value of milk for manufacturing purposes to warrant the operators in closing their manufacturing plants temporarily. A premium sufficient for this purpose is often paid in whole milk markets. To this extent the value of milk for manufacturing purposes sets the lower limit to the price of milk for direct consumption in any whole milk market.

But in the months of greatest production, the price over a season will tend to be practically uniform in all the primary markets of any country. The variations in price between primary market areas will be due either to differences in transportation costs, to the bargaining power of dealers or buyers, or to temporary producing or climatic conditions as indicated above. Seasonal and annual variations prove to be small, and about equal to freight on feeds or dairy products, however great the monthly variations.

The following table gives the average annual price for extra creamery butter and for whole milk cheese in Chicago and New York City for seven years, and the difference between the price in the two markets. This differential is not the same for succeeding years.

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The differential for butter averages 1.5 cents per pound for the seven years, and 0.9 cent per pound on cheese, or around 15 cents per cwt. on whole milk. The differential for butter was twice in 1918 what it was in 1917, yet less for cheese. The differential for Chicago is greater over San Francisco than here shown for New York over Chicago. Philadelphia prices range slightly above those in New York.

AVERAGE ANNUAL WHOLESALE PRICE OF BUTTER AND CHEESE,
NEW YORK AND CHICAGO, AND EXCESS OF NEW YORK
PRICE OVER CHICAGO PRICE, 1913-1919

BUTTER

	1913.	1914.	1915.	1916.	1917.	1918.	1919.
New York.....	\$0.323	\$0.299	\$0.2968	\$0.3409	\$0.4341	\$0.512	\$0.6010
Chicago.....	.310	.2873	.2836	.3254	.421	.4985	.5851
Difference.....	.013	.0117	.0152	.0155	.013	.0235	.0159

CHEESE

	1913.	1914.	1915.	1916.	1917.	1918.	1919.
New York.....	.154	.1518	.1509	.1805	.2390	.2666	.3155
Chicago.....	.142	.1438	.1423	.1744	.2265	.2637	.3019
Difference.....	.012	.0080	.0086	.0061	.0125	.0029	.0136

For the thirty months from January, 1918, to June, 1920, the price to the producers in the New York territory averaged 33 cents per hundred pounds above the price received by producers in Chicago territory. These may not be typical months. Thus the New York price was below the price in Chicago for August, September, October, and November,

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1919, because of the formula is use in New York territory in that year as described on page 60. There is no constant ratio as between any of the months for any season, however.

This point is enforced by an examination of the location of cheese and butter factories in the United States. Practically all the cheese factories in the United States "are located where the average growing season is less than 155 days, except along the immediate shores of the Great Lakes and the Pacific coast, where, although the growing season is longer, the temperature is cool." Cheese factories are located where the weather is cool enough to keep a uniform high grade of milk and where land values are low, pastures plentiful and the costs of summer production low. Nine-tenths of all the creameries are east of the Missouri and north of the Ohio river,¹ one-half in Wisconsin, one-fourth in New York State. The creameries are chiefly in Wisconsin, Minnesota, Iowa, Michigan, New Hampshire, Vermont, New York, and Pennsylvania.

The price for cheese and butter, as of other storage products, is fixed by national and international forces. Butter and cheese are both made in or near to the very regions supplying the larger industrial centers with whole milk. Only to a limited extent can the consumers of whole milk underwrite the losses of milk distributors in manufacturing their surplus milk into storage products. As soon as this difference becomes large, price factors

¹ See maps on pages 118 and 119 of "Geography of World's Agriculture", op. cit.

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force the price for whole milk downward to approach, if not to equal, the price for manufactured milk. But in the months of maximum production the price in any one of the primary districts must be about the same as in other primary districts, for price factors now determining the value of milk are the prices received or anticipated for butter, cheese, condensed and powdered milk. (See chart on page 79.)

A new factor that will stabilize the price of milk between the seasons of scarcity and the seasons of plenty is the growing use of dried milk.

The use of milk powders will have a stabilizing influence on the whole-milk market far beyond the expectations of most producers. Skim milk powder with sweet butter and water run through an emulsifying machine makes a reconstituted milk that, according to the best advice of specialists, may be as wholesome as natural milk. If made with filtered water, this remade milk cannot be surely told from natural milk. It may not taste as good as natural milk, but it is a fair substitute. The author finds considerable quantities of it used in towns large and small though not advertised or sold as such. When sold as fresh milk it is usually mixed with whole milk.

The economic significance of this remade milk has not been fully appreciated. Its wide use will mean that condensed skim milk from the Seattle region can be mixed with butter from Wisconsin and filtered water from the Hudson and sold in New York City

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as "Remade Milk." Whole milk powder can be used likewise. During the war the demand for milk powders by the American Red Cross and allied organizations has been so heavy that their use for domestic purposes has not been as large as would have been possible otherwise. We can expect a considerable use of these dried milks in the years to come.

There are three varieties of dried milk powders: Full cream, half cream and skim. The conclusion reached by British health authorities, after considering a wide use of milk powders for infants when breast feeding was impossible was that dried milk probably was no better than and perhaps slightly inferior to fresh cow's milk. Scurvy and rickets are rare in infants fed on this preparation, although the occasional use of fruit juice is desirable. In at least seventy-six districts in the United Kingdom milk powder was being used in maternity and child welfare stations. The growth curves of children fed exclusively upon dried milk from birth closely resemble the average growth curve of breast-fed children, although at somewhat lower levels by reason of the more delicate condition of these children. The health authorities in Great Britain have reached the conclusion "that cow's milk, during the process of desiccation, loses none of the characters which are necessary for the support of normal growth in infants." The wholesomeness of dried milk as compared with fresh milk is discussed in the chapter on the *Food Value of Milk*.

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The use of powdered milk will be a governor that may prevent abnormally high prices in the scarce months to farmers in whole milk regions, but it gives to farmers in other territories where milk may be cheaper, or to summer producers, a relatively wider market for their milk. The first effect of an extended use of dried milk may, therefore, be disadvantageous to the winter milk producers in or near large cities. This competition has its limits, however, depending upon the price of milk in the summer and the price of fresh butter. Moreover, there is no comparison between the taste of this remade milk and the taste of good natural milk, and the better tasting natural milk will have the wider sale under fair chances.

Skim milk powders keep indefinitely while whole milk and cream powders as yet do not. In 1917, 22,624,357 pounds of powdered skim milk were produced in the United States as compared with 25,432,007 in 1918. In 1918 we produced in this country 4,164,334 pounds of powdered whole milk, as compared with 3,138,809 in 1917.

While the processes for making condensed milk and milk powders both date in origin from the years just preceding the Civil War, the manufacture of dried milk has expanded notably in the last decade. Powdered skim milk is used by bakers for breads, biscuits, cakes, and custard in preference to whole skim milk or condensed milk because it is easier to handle and to mix. For the higher grades of cakes and biscuits whole milk powders are used. The ice cream manufacturer uses skim milk powder for

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giving "body" and smoothness to his product, and cream powders for richness. The confectioner uses whole milk and cream powders for his caramels, milk chocolates, and fudges. Milk and cream distributors use it both for making and standardizing their products.¹

The price factors at work in any one of these primary markets will keep the price practically uniform for the same grade of milk as between all the local markets within this primary market.

In the first place, there are towns and cities of no inconsiderable size and number within each of these primary markets. An increase or decrease of as much as one-half cent a quart is sufficient to draw milk into one town or city out of an area that has been furnishing another town or city. If the local supply of whole milk is short, dealers buy ice cream or cream or whole milk itself from other places, or they may make whole milk or cream from dried milk powders. If any variation in supply or price in

¹ The following definitions and standards for powdered milks have been recently adopted by the joint Committee on Definitions and Standards of the American Association of Dairy, Food and Drug Officials, and the Association of Official Agricultural Chemists:

"*Dried milk* is the product resulting from the removal of water from milk, and contains, all tolerances being allowed for, not less than twenty-six (26) per cent of milk fat, and not more than five (5) per cent of moisture.

"*Dried skim-milk* is the product resulting from the removal of water from skim milk and contains, all tolerances being allowed for, not more than five (5) per cent of moisture.

"*Malted milk* is the product made by combining whole-milk with the liquid separated from a mash of ground barley, malt, and wheat flour, with or without the addition of sodium chloride, sodium bicarbonate, and potassium bicarbonate in such a manner as to secure the full enzymic action of the malt extract and by removing water. The resulting product contains not less than seven and one-half (7.50) per cent of butter fat and not more than three and one-half (3.5) per cent of moisture."

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any local market seems to be permanent, investments in country receiving stations are made in another producing district offering cheaper prices. Within any primary market district, therefore, milk prices must tend to be uniform as between localities. The value to farmers and to dealers and manufacturers of price uniformity throughout any primary district is further discussed in Chapter VII.

In conclusion. The price of milk in local towns and cities must keep fairly equal throughout a primary market area. Prices for milk as between primary market areas will vary sufficiently in the season of scarce production to meet prevailing producing conditions. The variation has its limits due to the price of cold storage products. Variations in price in the season of maximum production as between primary markets for a number of years about equals transportation costs and rates on feeds or dairy products or both, though the price by months will vary with local conditions. In turn the prices in the primary market areas of any one country must keep in tune with national and world prices on storage dairy products.

The world market ever hovers over the price prevailing in the national, the primary and the local market. Milk and its products are stable in price because the storage products are mobile in transport.

CHAPTER V

The Cost of Production

Among all the forces which jointly determine the price that farmers must and will get for their milk, the cost of production is of first importance. Second in power only is the demand of the consumer dependent upon whether or not she believes the milk (or its products) is worth the price asked. One may convince a Fiji Islander that it costs fifty dollars to make a dress suit. But that fact alone will not convince the aforesaid Islander that the dress suit is worth fifty dollars to him. If he does not buy, dress suits are not made. So the consumer will not purchase milk unless she believes it is a good buy in comparison with what she thinks is the value of the alternatives. Nor will the farmer produce milk if, in the long run, he can get better living standards by engaging in other alternatives on the farm or in work other than farming.

As to these elementary facts there will be no disagreement. The problem beset with difficulties and differences in opinion and judgment is as to just what is the cost of producing milk at any given time.

First is the question whether the joint costs of farm operations as a whole shall be the cost unit or whether the cost unit shall be the cost of producing each article on the farm. As a matter of fact, both costs must be found before there is a final judgment

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as to either. Each is relatively useless without the other.

Two methods have been used to find out what is the cost of producing milk. One is the "field," the other the "formula" method.

The Field Method

The "field" method is to ascertain the cost of producing milk from actual cost records kept by farmers on their own farms or by agricultural experiment stations. A considerable number of such investigations have been made in all parts of the country. As chairman of the Tri-State Milk Commission appointed by the Governors of Pennsylvania, Maryland and Delaware, the author was given the responsibility for conducting such an investigation in the states named. Thousands of letters were sent out in an attempt to find all the cost records available in the district. Many others have used the same method.

This method has many merits. In the first place, the farmers' own records constitute the testimony. This has the advantage of personal direct contact with the cost data of those who will be directly affected by the results. It has the merit also of limiting evidence to concrete facts and conditions. It throws out the biased opinion testimony that has been used in some quarters under the formula method. The consumer as well as the farmer has confidence in the method because it is personal and factual.

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The difficulties with this method are not, as has been so frequently stated, that dairymen do not keep records sufficiently accurate and detailed. In these days of cow testing associations and county farm agents the percentage of farmers who are keeping accurate cost records on dairy farms is relatively as large as is the percentage of factory owners or of small merchants who keep cost records for their respective businesses. The number of such records on dairy farms is now sufficient to justify conclusions.

The difficulty with the method is to select from the records filed those that are typical of the dairying conditions in the district. If a dairy is kept on land of high value for suburban dwellings the amounts charged to rent or to return on land owned should be stated separately so that that portion of land values due to holding it for speculative real estate purposes will be reflected in its own account and not in the dairy account. Fancy stock farms run as hobbies by city gentlemen must show by the records the costs due to high tastes and rustic pleasure, and the losses due to poor judgment as well as the *bona fide* costs of the dairy. Again, milk costs on a farm not suitable for dairying may have little value as guidance to milk costs in districts adapted to dairying. The records themselves must be examined in all cases for assurance of accuracy.

The cost records used as the basis for judgment must be typical costs from typical dairies in the typical dairy district in the region, if the purpose is to find out the cost of producing milk for a city in

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the dairy districts supplying the city, as distinct from the cost of producing milk on a given farm for the guidance of the owner or operator of the farm.

In the Cleveland district the average number of cows on the dairy farm is about eight. The size is kept down to the number that will consume all the roughage grown on the farm. In other districts, such as Baltimore and Washington, D. C., the herds are larger. Again the length of the pasturing season and the value of the pasture will vary from section to section. The value of land per acre will reflect the most profitable uses to which the farms in a given neighborhood are or can be put. These uses may not include dairying. In public testimony particularly one may hear most from those hurt worst. And these may be affected by factors other than dairy costs under good practice in a region suitable to dairying. Moreover, the findings as to production costs by this method are accurate only so long as feed and labor costs do not change materially.

It is only when applied with such facts as these in mind that the "field" method is accurate. But applied with such facts in mind the method gains the confidence of farmers and consumers; it gets at the real facts; it discovers not only the many economic factors at work in a given territory to increase or decrease dairying herds, but it also compares the profitableness of dairying with other uses of the farm. To be worth while, the reports used for such purposes should be of continuous and permanent record.

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The Formula Method

The formula method is the outgrowth of the facts ascertained in these "laboratory" investigations. The dairy cow is to a considerable extent a standardized factory. She is not exactly standardized or breeders' and cow testing associations would have little need for existence. But to the extent that the dairy cow is a standard factory, one can estimate the costs of her factory product (milk) by multiplying the units of raw materials (feed) and labor employed in producing that product by the prevailing price of the raw materials and the prevailing wages for labor. The great value of the method lies in the fact that it can be used in periods of rapidly changing feed prices and labor wages.

The splendid field work of such dairy experts as Professor Fred Rasmussen of Pennsylvania State College had to precede the working out of the formula method. Then came the work of Professor Larson on "Milk Production Cost Accounts."¹ Other professors in agricultural colleges undertook to find out the constant units to which the prices for these units prevailing at a given time could be applied to ascertain the cost of producing milk under any given schedule of feed costs and wages. Among such men should be mentioned Professor F. A. Pearson of the University of Illinois, Professor Anderson of Michigan Agricultural College, Professor H. C. Taylor of Wisconsin and Professor G. F. Warren of Cornell.

¹ Larson, C. W., "Principles and Methods of Milk Production Costs and Accounts," New York, Columbia University Press, 1916.

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Just about the time certain of these experts were maturing their studies a committee¹ was appointed, of which the author was elected chairman, to report to Mr. Herbert C. Hoover as Federal Food Administrator on "The Production, Distribution and Food Value of Milk." Professors Pearson and Warren were on this committee. To them as a sub-committee was assigned the task of reporting to the whole committee on production costs. Material long in being collected by these two professors and costs records secured by correspondence from many other sources were used in making their report. From the records of many thousands of cows, they selected records for 976 cows on 490 farms producing milk for city markets in six northern states. The states were: Minnesota, Michigan, Massachusetts, Connecticut, New York and New Jersey. On the average 49.3 per cent of the milk of these herds was produced in the six months beginning in October. From their examination of these costs and quantity records, the sub-committee found that in these herds the average quantities of feed and labor used to produce 100 pounds of milk were:

- 2.88 hours of labor.
- 33.5 pounds of grain (concentrates).
- 45.3 pounds of hay.
- 11.5 pounds of other dry forage.
- 93.2 pounds of silage.
- 9.4 pounds of other succulent feed.

¹ The members of this committee were: Clyde L. King, *Chairman*; Mrs. A. W. Smith, F. A. Pearson, J. W. Sullivan, Gifford Pinchot, G. F. Warren.

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The committee report from this point based upon the reports of this sub-committee follows:

The above items made 80.8 per cent of the total yearly average net cost of milk after the value of the calf and manure and miscellaneous returns were deducted from the cost. The amount of feed consumed is much more than the average in winter and less in summer. Approximate average yearly costs of production with given prices of feed and labor can be estimated for the above averages. But the costs in summer are much below the average, and in winter are more than the average.

Some estimate of prices to be expected can be made by comparing past prices for different months. The comparative prices paid to producers for milk in different months when the average for the year is 100 per cent have been as follows:

PERCENTAGE OF YEARLY AVERAGE PRICES PAID TO FARMERS
FOR MILK FOR TEN YEARS ENDING OCTOBER 1, 1916.
NEW YORK AND CHICAGO.

Month.	Chicago Milk News.	New York "26-cent sone" Milk Reporter.	Month.	Chicago Milk News.	New York "26-cent sone" Milk Reporter.
January.....	117.2	119.0	July.....	84.8	81.0
February.....	112.6	114.7	August.....	95.4	90.8
March.....	104.6	106.1	September.....	98.0	96.9
April.....	95.4	93.9	October.....	107.2	110.4
May.....	79.4	79.1	November.....	115.8	119.0
June.....	71.5	70.6	December.....	118.5	120.2

An approximate estimate of prices that might be expected can be made by using the quantities of feed and labor required and the past yearly distribution of price as shown in the above

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table. For instance, if labor is 25 cents an hour, grain \$55 a ton, hay \$15, other dry forage \$7, silage and other succulent feeds \$6, the average yearly net cost of 100 pounds of 3.7 milk for herds as good as those reported would be \$2.88. If the average price were \$2.88, and if the prices in different months followed the average course, the New York November price to the farmer might be expected to be approximately \$3.43 (7.37 cents a quart), and the June price \$2.03 (4.36 cents a quart).

If labor is 20 cents, grain \$45, hay \$10, other dry forage \$5, silage and other succulent feeds \$4, the average yearly cost would be \$2.22. If the average price were \$2.22 and if the prices in different months followed the usual course, a November price of approximately \$2.64 might be expected, and a June price of \$1.57.

If labor is worth 30 cents, grain \$65 a ton, hay \$20, other dry forage \$10, silage and other succulent feed \$8, the yearly average cost would be \$3.56. If the average price were \$3.56, and if the distribution by months followed the average course, a November price of approximately \$4.24 (9.12 cents a quart) and a June price of \$2.51 (5.4 cents a quart) might be expected.

On the basis given above the farmer would receive more than the assumed wage in summer and less in winter because the difference in cost between summer and winter, if wages are uniform, is more than the difference in price.

With the publication of these results the formula method was used more or less by each of the various Milk Commissions appointed by the Food Administration in the different primary markets of the

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country. It was used notably by the Chicago Milk Commissions. In the summer and autumn of 1918 Judge W. E. Lamb, representing the United States Food Administration, and the farmers and distributors in the Chicago market used the formula method to arrive at a price to producers. The formula thus used in the Chicago district was known as the Modified Pearson Formula because of Professor Pearson's pioneer work in developing the formula, and his rational and fair application of it, and because of his modification of his formula obtained from actual feed records to one easier of practical use in price fixing.

Professor Pearson's researches had led him to believe that in the Chicago district 44 pounds of grain, 118 pounds of silage, 50 pounds of hay, 39 pounds of dry forage and 2.42 hours of labor produced 100 pounds of average milk. After a thorough investigation he found that the following "modified" formula would yield substantially similar results and give a definite market basis for feed prices: 20 pounds of home grown grains based on the value of corn, 24 pounds of manufactured feeds, 110 pounds of hay and 3 hours of labor.

The following memorandum, adopted on July 1, 1918, under the mediation of Judge W. E. Lamb for the United States Food Administration, will indicate the methods agreed on by these parties for determining price units and for making monthly distribution of the average yearly price thus arrived at:

THE COST OF PRODUCTION

The price to be paid by purchasers of milk to the producers in the so-called Chicago district for the month of July is \$2.30 per 100 pounds for 3.5 per cent milk; four cents to be added for butter fat, for each point above that amount and same amount to be deducted for each point below 3.5 per cent. The retail price for delivered bottled milk in Chicago for the month of July, 1918, is to remain at 12 cents per quart.

The prices for milk to be paid to the producers in the Chicago district for the months of August, September, October, November and December, 1918, are to be determined in the following manner:

On or about the 15th day of the month preceding each of the above named months the representatives of producers, distributors, ice cream manufacturers and condensers of milk in the Chicago district are to meet the representative of the Food Administration and in arriving at the prices to be paid producers for milk for the month under consideration, the following feed and labor formula, to-wit:

20 pounds of home grown grains,
24 pounds of manufactured feeds,
110 pounds of hay,
3 hours of labor,

shall be taken as correctly representing the average amount of feed and labor required to produce 100 pounds of milk in said district during said period, the same being the feed and labor formula determined by the Chicago Milk Commission.

The values of the respective amounts of grain, feeds, hay and labor aforesaid in any given month are to be arrived at as follows:

First.—The value of the 20 pounds of grain and the 110 pounds of hay determined by using the

THE PRICE OF MILK

farm values of corn and hay in the states of Illinois and Wisconsin reported by the Agricultural Department on the first day of the preceding month, the figures usually being available by the tenth of the month.

Second.—The value of 24 pounds of feed to be determined as follows:

The per ton values of the following feeds, f.o.b. Milwaukee or Chicago, are to be taken from the daily *Feed Report* published at Milwaukee, to wit:

Ajax, Unicorn and Arcady mixed feeds; all kinds and grades of molasses feeds; cottonseed meal; oil cake meal; gluten feeds; hominy feeds; brewers' grains; bran, middlings and Schumacher feeds. The f.o.b. per ton prices as quoted in said daily paper to be added together and the average per ton found. To that average price per ton shall be added the average freight rate applying from Milwaukee or Chicago to points within the Chicago district, which is today approximately $7\frac{1}{2}$ cents per 100 pounds. In addition, there shall be added to the average per ton price so reached the profit per ton allowed by the Food Administration to the retail dealer in such feeds, and then there shall be added the further sum of \$1.50 per ton as the cost of hauling the same from the feed dealer's place of business to the farm of the consumer.

Third.—The value of three hours of labor to be determined by the average going prices for farm labor paid within the Chicago district.

When the values of the various items have been determined as aforesaid and added together the percentage table set forth below and known as the Pearson Percentage Scale shall then be used to finally determine the price for milk for the month under consideration, to wit:

THE COST OF PRODUCTION

	Per Cent.		Per Cent.
January.....	117	July.....	85
February.....	112	August.....	95
March.....	105	September.....	100
April.....	95	October.....	107
May.....	80	November.....	115
June.....	70	December.....	119

This table is based upon the average monthly prices paid for milk for a ten-year period from which Professor Pearson found that taking the month of September as representing the average monthly price of 100 per cent, the price paid in January was 117 per cent of the average; February, 112 per cent; March, 105 per cent; April, 95 per cent; May, 80 per cent; June, 70 per cent; July, 85 per cent; August, 95 per cent; October, 107 per cent; November, 115 per cent; and December, 119 per cent of the average monthly price, and it being believed that these percentages fairly reflect the same relative differences in cost of production either above or below the average, the percentage of the values of the various items in the feed and labor formula as aforesaid shall be taken as represented by the percentage figure opposite such month under consideration; that is to say when the values of the various items of feeds, hay and labor have been determined, as hereinbefore provided, for the month of August and the sums thereof added together, 95 per cent of such sum shall constitute the price for the month of August and the percentage applicable to each subsequent month applied in a like manner to the values of the items in the feed and labor formula determined in the same way for such subsequent month.

If increases result in the prices to be paid for fluid milk under the foregoing plan in such an

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amount that the distributors of fluid milk in Chicago cannot afford to deliver the same at 12 cents per quart, such increase in the retail price shall be permitted as will enable the distributors to overcome such increases in price and cost.

The Food Administration will procure each month as soon as they may be available the farm values of corn and hay in the States of Illinois and Wisconsin reported by the Agricultural Department as of the first of each month and communicate such figures to the representatives of the parties in interest. The wholesale prices of feed are to be taken from the *Daily Feed Report* and averaged for the month preceding the month in which the conference is held.

The foregoing correctly sets forth the understanding of the representatives of the parties in conference with the undersigned on the 28th and 29th days of June, 1918, at the office of the Food Administration, Conway Building, Chicago, Illinois.

Dated, July 1, 1918.

The application of this formula is illustrated from the following excerpts from the memorandum issued by the same group and signed by Judge Lamb for determining the price for August, 1918:

It was agreed at the conferences on June 28th and 29th that the farm values of corn and hay should be those reported on the first day of the month preceding the month in which the price of milk was under consideration. The Agricultural Department reports the farm value of corn and hay in Illinois and Wisconsin as of July 1, 1918, as follows:

THE COST OF PRODUCTION

Corn: Illinois	\$1.32 per bushel
Wisconsin	1.53 " "

or an average of \$1.43 " "

Hay: Illinois	\$15.80 per ton
Wisconsin	15.90 " "

or an average of \$15.85 " "

The prices of feeds in the district were determined as follows:

The average monthly prices for June of the following feeds, f.o.b. Milwaukee:

Ajax, Unicorn, R.K.D. mixed feeds; Sucrene and International Milling Company's molasses feed; cotton seed meal; oil cake meal; gluten feeds; hominy feeds; brewer's grains; bran; middlings and Schumacher feeds. As the prices of corn and hay reported by the Agricultural Department as of July 1st represented the average farm prices of hay and corn for the previous month the prices of the foregoing feeds were taken for the same period and the average of all was found to be \$47.24 per ton, to which was added the average freight rate of $7\frac{1}{2}$ cents per 100 pounds or \$1.50 per ton; \$2.00 per ton, the profit allowed by the Food Administration to the retail dealer of feeds handling the same in ton lots or less and \$1.50 per ton haulage charge from the feed dealer's place of business to the farm of the consumer, which made the average price of all classes of feeds for the period mentioned \$52.24.

The average price of farm labor in the district after careful investigation was found to be 30 cents per hour.

The average price of corn at \$1.43 per bushel for the period mentioned equals \$2.55 per 100 pounds, or 2.55 cents per pound. The average

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price of feeds of \$52.24 per ton equals \$2.612 per 100 pounds, or 2.6 cents per pound.

The average price of hay of \$15.85 per ton equals 7.9 mills per pound.

Using these factors, we find 20 pounds of corn is of the value of 51 cents; 24 pounds of feed is of the value of 62 cents; 110 pounds of hay is of the value of 87 cents; 3 hours of labor at 30 cents per hour, 90 cents, making a total of \$2.90.

After determining the prices of the items as aforesaid to determine the final price that shall be paid for the milk it was also agreed that Professor Pearson's percentage table should be used. That table treats September as the 100 per cent month, or the average of the twelve in the matter of price. April, May, June, July and August are below the average; October, November, December, January, February and March are above the average. It was determined that the price for August should be 95 per cent of the average based on the foregoing formula; 95 per cent of \$2.90 equals \$2.75, or the price per 100 pounds that the producers are to receive for the month of August. This is for $3\frac{1}{2}$ per cent milk, with a differential of 4 cents for each one-tenth of 1 per cent of butter fat above, or a reduction in the same amount for each one-tenth of 1 per cent of butter fat below $3\frac{1}{2}$ per cent.

If the feed and labor formula adopted is correct and it was the one the Chicago Milk Commission determined to be correct, after careful deliberation and consideration, there can be no question as to the correctness of the price of milk for August determined in the manner indicated. When it is taken into account that the number of pounds of milk produced by the average cow per year is about 5000 pounds, it means a daily average of

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about 13½ pounds. This would require something over seven days to produce 100 pounds. It is believed that the amounts of feeds stated are not more than necessary to produce 100 pounds of milk on the average.

For six months the Chicago group used the Modified Pearson Formula with evident satisfaction to all, as all parties joined in an effort to get reasonable results with rational methods. It was abandoned, however, immediately upon the withdrawal of the Food Administration, and methods were adopted that secured a lower price level (see page 125).

With this success in mind, Judge Lamb in the early autumn of 1918 suggested that the purchasers of milk and the organization of dairymen in the New York district likewise agree on a method and a formula, and price units.

The formula to which the New York buyers and sellers turned attention was the Warren formula, based on the testimony of Professor Warren to the effect that, to produce milk of the average butter fat (3.8 per cent) in the New York district, the following feed and labor units were required:

Grain.....	33.79 pounds
Hay.....	43.3 "
Other dry forage.....	10.8 "
Ensilage.....	92.2 "
Other succulent food.....	8.3 "
Human labor.....	3.02 hours

When proper current prices were applied to these items, the result according to Professor Warren, was 79.9 per cent of the cost of producing 100 pounds of

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3.8 per cent milk, the remaining 20.3 per cent to represent all overhead expenses such as (1) interest on that portion of equipment devoted to the dairy, (2) the full depreciation on cows so that herds would be fully maintained, (3) bull expense, and (4) all minor items such as fly killer, etc. The 100 per cent price for producing 100 pounds on the average yearly cost was to be distributed by months as follows:

	Per Cent.		Per Cent.
January.....	119	July.....	81.0
February.....	114.7	August.....	90.8
March.....	106.1	September.....	96.9
April.....	93.9	October.....	110.4
May.....	79.1	November.....	119.0
June.....	70.6	December.....	120.2

This method was abandoned after a short trial, upon the withdrawal of the Food Administration, and prices since have not been equal to those brought about by the formula.

To get results with the formula method the sources for price units must be agreed on and methods must be such as to lead to accuracy, and rational results. For instance, in the Chicago district farmers and distributors each conducted their own survey as to what were the actual going wages on the dairy farms, each with the desire to obtain only the actual facts. The results as found by the dealers and farmers respectively were not over one cent an hour apart and the figure first agreed on (30 cents an hour) was a fraction of a cent above the average hourly wage found by the producers.

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Many difficulties have arisen in applying the formula method when one party to collective bargaining wanted results all in its own favor and was ready to use inaccurate methods to get them.

The following table from Hoard's "Dairyman" of November, 1918, summarizes the various formulas and their results in price.

COMPARISON OF SEVERAL SURVEYS SHOWING THE ITEMS ENTERING INTO THE COST OF PRODUCING 100 POUNDS OF MILK

Factors in Formula.	Pearson.	Modified Pearson.	Warren.	Hoover.	Indiana.	Michigan.
Grain (pounds)	44.00	44.00	33.80	33.50	28.9	23.50
Hay (pounds)	50.00	110.00	43.30	45.30	38.1	34.90
Silage (pounds)	118.00	.....	100.50	102.60	104.8	110.40
Roughage (pounds)	39.00	.....	10.80	11.50	9.9	15.20
Labor (hours).....	2.42	3.00	3.02	2.88	2.4	2.11
Corrective factor (per cent)....	0	0	25	23.7	...	45.8

COST OF PRODUCING 100 POUNDS OF MILK ACCORDING TO CERTAIN FIXED PRICES AS APPLIED TO DIFFERENT FORMULAE

(Feed and Labor Costs those of Autumn of 1918)

Factors in Formula.	Pearson	Modified Pearson.	Warren.	Hoover.	Indiana.	Michigan.
Grain.....	\$1.10	\$1.100	\$0.845	\$0.838	\$0.723	\$0.588
Hay.....	.500	1.100	.433	.453	.381	.349
Silage.....	.564	.....	.301	.308	.314	.331
Roughage.....	.078	.....	.023	.023	.020	.031
Labor.....	.605	.750	.755	.720	.600	.523
Total feed and labor.....	\$2.847	\$2.950	\$2.357	\$2.342	\$2.038	\$1.823
Correction.....	0	0	.589	.655	?	.834
Total cost.....	\$2.847	\$2.950	\$2.946	\$2.887	?	\$2.656

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The "Hoover" report is the committee report described above. The "Michigan" report refers to the formula by Professor Anderson. The "corrective factor" has been noted above in discussing the Warren formula as the amount allowed for overhead expenses.

The following table compares the results of certain special studies made as to the proportion in the cost and returns of milk due to such items as feed, labor, taxes, equipment, bedding, etc. These studies were all made before the war:

PERCENTAGE COST OF FACTORS IN PRODUCTION OF MILK

	Massachusetts.	Connecticut.	New Jersey.	New Hampshire.	Larson, Columbia University.	Delaware County, New York.
Feed.....	54.3	57.6	63.3	49.4	52.7	67.8
Labor.....	21.5	21.8	22.4	21.8	18.9	18.6
Taxes, cattle.....	10.1	11.3	7.8	9.0	6.5	2.0
Miscellaneous.....	5.5	1.3	...	3.0	4.5	0.9
Buildings.....	4.6	2.5	2.6	6.1	5.7	4.4
Keep of bull.....	2.4	1.9	1.0	2.5	2.5	...
Equipment.....	0.7	...	...	0.3	...	0.4
Bedding.....	...	3.2	2.7	2.7	2.3	0.8
Hauling milk.....	...	...	...	4.8	6.9	5.0

PERCENTAGE RETURN OF FACTORS IN PRODUCTION

	Massachusetts.	Connecticut.	New Jersey.	New Hampshire.	Larson, Columbia University.	Delaware County, New York.
Manure.....	9.2	6.5	10.4	10.1	13.2	7.5
Calf.....	1.2	3.2	3.1	2.0	1.9	2.7
Balance for milk.....	89.6	90.3	86.5	87.9	84.9	89.8

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The formula method, when fairly used, is a valuable guide to production costs. It does not give "the cost of production" within any exact sense of those words. The per cent of error in the assumption that the cow is a standard factory is one that few would attempt to state numerically. The costs for the same cow in a hard winter like 1917-18 are larger than in a mild winter like 1918-19. Moreover, the percentages assumed for the monthly distribution were based on the average of *market* prices for ten years and are not based on any monthly variation in production costs. For instance, are March costs actually 14 per cent lower than November costs? Milk is produced more freely in March than in November, and the prices of dairy products in storage break because the season of plentiful supply is at hand. How much of this average ten year variation was due to this market fact of greater supply and how much to the cost fact that the cows naturally produce more with less attention in March than in November? In both the Chicago and New York markets during the ten years when the market averages were taken, more and more milk had to be taken for whole milk consumption in the autumn months because of growing city populations. Was this fact properly reflected in the price paid for milk? Is this proportional increase in the need for milk for city consumption the same now as in those ten years? Again, just what is the value of a day's work on a farm in winter as compared with a day's work at seeding or harvest

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time? Assume that the price of milk is based on the average going wage actually being paid. Is there any seasoned old farmer who will not, in his own mind, make his own estimate on these matters and plan his farm output accordingly? Is the labor of women and children during seasons when it has no market value to be figured in at an assumed market value? Will the attempt so to do "raise the standard of living on the farm" or will it merely shift the milk industry from one section to another? Or, after a period of reflection, will each farmer make up his own mind about these things and pay little heed to "costs" proved by "theoretical" formulas? The higher the price of milk the higher the price for feeds, and the higher the price for feeds, the higher the price for milk. Price fixing is not so simple as the formula method implies.

Professor Pearson submits the table on the next page comparing the price actually paid in the Chicago market from August, 1918, to June, 1920, inclusive, with the price called for by his formula. For the first six months of this period the formula was used for price determination. Thereafter it was not used.

The following facts are gleaned from this table:

(1) During the seventeen months following the abandonment of the formula method the price actually paid was below that called for by the formula for twelve months and above the formula price for five months. These five months were: June, August and September, 1919, and June, 1920.

(2) The average price paid for these seventeen

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months was \$3.14 as compared with \$3.33 called for by the formula, or roughly one-half a cent per quart.

(3) For the months of August, September and October, 1919, the market price averaged 7 cents per hundred weight above the formula price.

(4) The formula price called for an increase of about 10 per cent in the average price for November, December and January over the average price for

**THE PRICE ACTUALLY PAID PER HUNDRED POUNDS FOR MILK
AND THE FORMULA PRICE FOR MILK, CHICAGO DISTRICT,
AUGUST, 1918, TO JUNE, 1920**

Date.	Formula Price.	Milk Price.	Date.	Formula Price.	Milk Price.
1918:			1919:		
August.....	\$2.75	\$2.75	July.....	\$2.94	\$3.00
September.....	2.92	2.92	August.....	3.23	3.52
October.....	3.15	3.15	September.....	3.46	3.55
November.....	3.65	3.65	October.....	3.82	3.63
December.....	3.77	3.77	November.....	3.85	3.60
			December.....	3.88	3.65
1919:			1920:		
January.....	3.76	3.76	January.....	3.88	3.60
February.....	3.70	3.50	February.....	3.81	3.35
March.....	3.40	3.00	March.....	3.70	2.90
April.....	3.99	2.80	April.....	3.40	2.75
May.....	2.57	2.50	May.....	2.92	2.70
June.....	2.35	2.50	June.....	2.66	2.75

the preceding three months; the market price (1919) was but 1½ per cent greater.

(5) For the first six months of 1920 the price paid averaged \$3.01 as compared with \$3.40 called for by the formula.

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(6) The price paid for the last six months of 1919 was \$3.50 as compared with \$3.53 called for by the formula.

(7) During the last six months of 1919 and the first six months of 1920 the price paid was above that called for by the formula in July, August and September, 1919, and in June, 1920. But for this year as a whole the price paid was \$3.38 as compared with \$3.33 called for by the formula, practically the same, as higher prices were paid in four months of higher production.

The formula does not reflect the market possibilities. The sales price of competitive commodities and their costs seldom run hand in hand. And one cannot be used as a measure of the other. But the Pearson formula does reflect in general what production costs are. But the percentage distribution of the cost cannot be the same as that over any past period.

To the extent that the market outlets and the producing conditions and habits of any given region remain fairly constant can the formula method have any value as a guide to price. The price to the farmer year in and year out will approach the formula prices to the extent that it reflects truly *both* costs and marketing conditions. Only in so far as an historical, average, monthly distribution of prices happens to run parallel with the current cost and marketing factors can a formula based on the past be accurate at the present.

We need continuous reports as to the costs and

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net returns of dairies in the same neighborhood; as to the costs and net returns of each farm product; as to costs and net returns of the farm as a whole; as to the relation between the net returns of different products to which the resources of the farm can be turned; and also the facts as to the changes in farm output going on in any one region and the reasons therefor. This side of the science of farming has been neglected. When we have all such facts we will probably explain the sound sense that has caused dairy farmers to increase milk production as they have for certain periods at prices below the "costs" proved by a formula.

Notable work has been done quietly in building up efficiency in dairy costs by J. M. McKee, County Agent of Washington County, Pa. By keeping accurate data on such items as output per cow, quality and quantity of feed consumed per cow, and the hours of labor expended on the different dairy operations, such as milking, feeding, cleaning stables and hauling milk, he has been able to compare the cost items in each dairy with the average cost items in all the dairies. For instance, as to hours of labor including the hauling of milk, McKee has found a variation of from 159 to 231 per cow, with an average of 223. He finds a variation of from 2.1 to 6.3 pounds of milk produced from one pound of feed, the average being 3.13 pounds of milk to 1 pound of feed. Out of 23 herds, 16 showed a profit and 7 a loss. The profit per cow varied from \$95.00 profit to \$27.65 loss. Mr. McKee has also done well one other

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thing: he has computed feed and overhead costs and then given to each of the farmers what his labor is netting him per hour on the basis of assumed overheads, and he assumes a given hourly wage and reports the net return on the investment at that wage. Mr. McKee writes the author:

The dairymen are showing an increased interest in cost of production records and what the price they receive will pay them in wages per year, but to secure this information it is necessary to make a study of the entire dairy business and in so doing we find many places to increase the efficiency of production of the plant so that in many cases they can get an increased wage per hour through cheaper production.

Cost of Production

The cost of producing milk is not easily ascertained. But that is no reason why it is not important. For as are the alternatives to the farmer so will his choices be. Every time a farmer plans his crops he makes those choices.

It is not to be presumed that because the costs of the different products of the farm are inter-related and their allocation difficult that the dairyman will go on producing milk without adequate compensation. The mere fact that he is growing other products every year gives him choices as to what product is most profitable for him.

The consumer must realize that standards of living must rise in the country in proportion to the standard in the cities. Costs of producing milk like the costs

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of producing steel, will rise as living standards rise. Farmers will not continue to work the members of their families when city earners need not do so. We cannot continue to add to the values, profits and wages in manufacturing industries and not bring up living standards in the country to meet those in the city.

The whole problem of milk costs is involved with industrial stability and social well being not only in the city but also in the country—and in the city and in the country of all nations.

CHAPTER VI

Should Dairymen Organize for Collective Bargaining?

There has been in recent years a revolution in the method of receiving, manufacturing, storing and distributing milk and milk products.

The time was when the manufacture of butter was solely a household industry. The first creamery built in the United States dates back only to 1856. Soon after the Civil War period small cross-roads creameries began to increase in number throughout the country. Well does the author remember the glowing promises made in the early "nineties" by those organizing local coöperative creamery companies. Those coöperative plants were usually built to serve the dairymen of the immediate vicinity only.

About 1890 the centrifugal separator was placed on the market and Professor Babcock gave to the industry in the Babcock tester a quick and reliable method of ascertaining the percentage of butter fat in milk. Shortly after this, cold storage on a large scale was perfected. Following the development of cold storage plants on a large scale came the large butter centralizers such as the Beatrice Creamery Company, the Blue Valley Creamery Company, the Fairmount Creamery Company and the Hanford Produce Company, the largest of which makes from 15,000,000 to 20,000,000 pounds annually, in many

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plants widely separated. These large plants gradually added facilities for manufacturing the by-products of skim milk.

Fast on the heels of these large butter concerns came the large condenseries, likewise under the control of central companies. Such are the Borden, Mohawk, Helvetia, Carnation, and Nestles' Condensed Milk Companies.

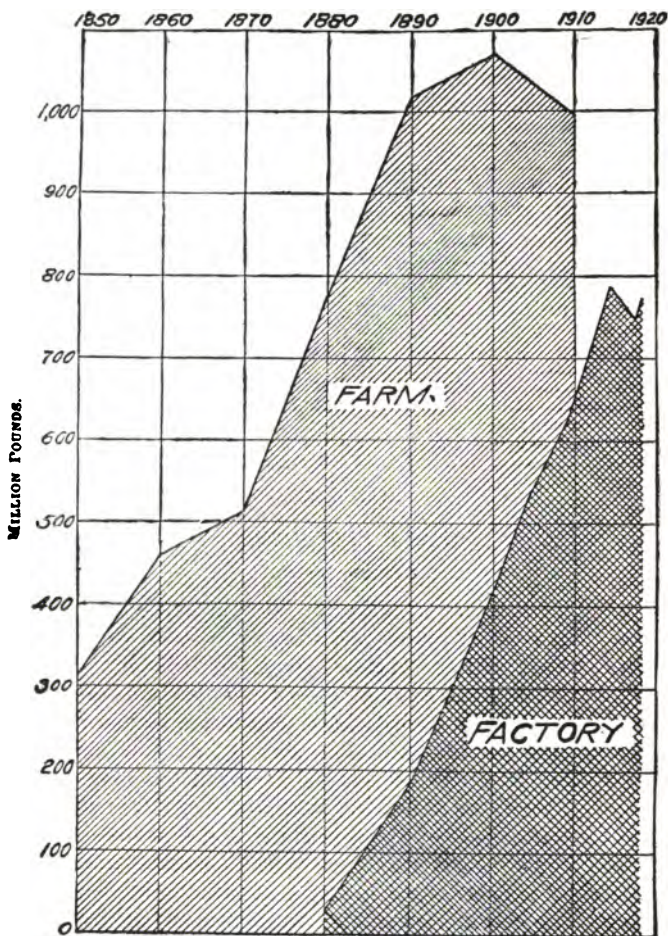
The home churn and the cross-roads creamery could no longer effectively compete with the buying, manufacturing, storing and selling facilities of these large concerns. What was a household industry had become a big manufacturing industry. Charts Nos. XIII and XIV on pages 132 and 133 indicate graphically the expansion of the butter and cheese factory industry at the expense of the household butter and cheese industry.

In 1909, 1,619,415,263 pounds of butter was made in the United States, or an increase over 1899 of 8.6 per cent. Of this amount 994,639,619 pounds was made on the farm and 624,764,653 pounds in the creamery. This was in ten years a decrease of 7.2 per cent in home-made butter and an increase of 48.7 per cent in factory butter.

The time was, and not so very long ago, when milk was distributed to the consumer in the city from house to house by the dairymen who produced it in the country. The only facilities for caring for it in the country were the side-hill spring house or the cellar. Today in most cities of any size there are but a few large milk distributors. These dis-

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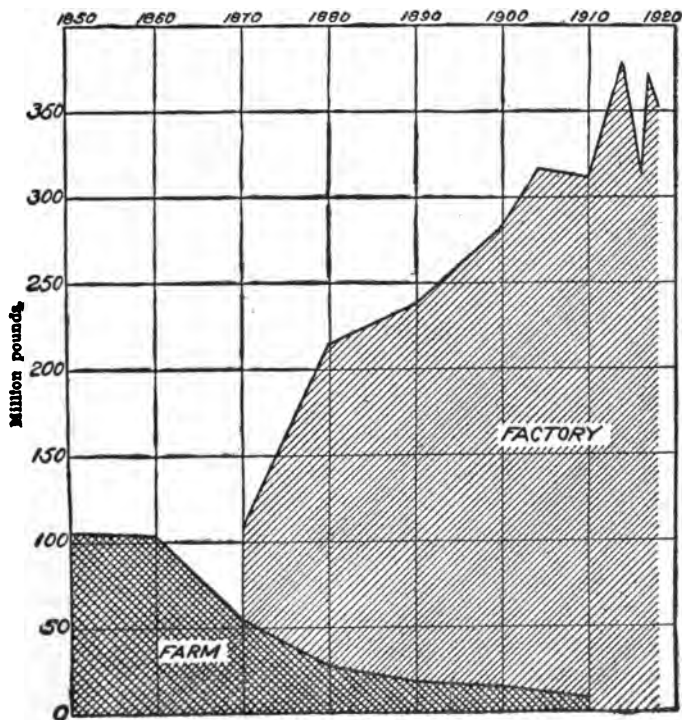
CHART NO. XIII.—FARM AND FACTORY BUTTER PRODUCTION
IN THE UNITED STATES SINCE 1850¹



¹ From Circular No. 70, United States Department of Agriculture, by John R. Mohler.

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CHART No. XIV.—FARM AND FACTORY CHEESE PRODUCTION IN THE UNITED STATES SINCE 1850¹



tributors own receiving stations in the country to which the milk is brought direct from the farm and there properly cooled and cared for in quantities sufficient to make the cooling and handling cost per quart very small. Moreover, the large distributors soon added facilities for economically manufacturing,

¹ From Circular No. 71, United States Department of Agriculture, by John R. Mohler.

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storing and selling the milk products made from the surplus milk for which no market could be found in the wholesale or retail milk trade. The receiving stations reach out great distances from the cities served by the distributors. Until recent years the manufacturing of condensed milk and evaporated milk was open to practically all comers with but little investment. Now, with the market more or less monopolized by widely advertised brands, pushed by high grade sales-agents, the condenseries have been consolidated until not over a half dozen firms control the major output of the condenseries of both Europe and the United States. While of the total milk produced in this country the portion going into condenseries (2.9 per cent) is small, the strategic location of these plants and their importance in handling surplus milk in those weeks of the autumn and spring when condensed milk offers a better market for milk products than do butter or cheese, gives to the few large condensing companies with receiving stations scattered in every large dairy district a position of forcefulness in price determination throughout most of the year.

With the development of these large industrial units came heavy investments both in the city and in the country that had to be protected. These investments were made in order to handle milk and its products most economically. One source of economy was the choice of favorable locations for receiving plants in order that they might be supplied with the volume of milk necessary to low cost per

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unit handled. Thus, it has come about gradually that in any one dairying community there is now usually but one readily accessible receiving station at which the producer can, within a reasonable haul, find a sale for his milk.

These investments made possible the proper care and handling of milk, and provided the most economical method of manufacturing, storing and selling it. Hence through them came to the farmer and to the consumer the possibilities of a more favorable price through lower costs of receiving, manufacturing, distributing and selling milk and its products.

But this change had left only one good near-by market open to the farmer. When the producer saw that the result of this revolution in dairying, just described, was that his only market for selling his milk to good advantage was the local receiving station of a large milk factory or milk distributor, he began to grow restless concerning the power of these buyers to dictate the price he must accept for his milk. Thanks to American traditions, the producers began to question the fairness of the price they received even though that price was more than they could get, or could have gotten, or had ever received, in any other way. There was a more or less actual monopoly to which the producer *must* sell his milk. The producer therefore joined with other producers to protect his price, hence the "Dairymen's Organization" now present in every primary milk market in the United States.

In the face of such conditions it is obviously to the

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best interests of all that there should be such farmers' organizations. The purchasing power confronting the producer, if not organized, was thoroughly centralized, because purchasers were few in any district. In many instances, if not in most instances, the price proffered the farmer in the years preceding these organizations was without doubt not a fair price.

Even if the price proffered by these milk buyers be the fairest of prices, it is still to the interests of the buyers themselves that milk producers should be thoroughly organized. For through collective bargaining the producers feel that they are a party to the price and hence suspicion and gossip—the twin slayers of business security—cease to be. The best price interpreter to all farmers is the farmer who has had a "say" in determining the price to be paid for milk by local buyers.

A dairymen's organization manned by fair-minded farmers is an asset to the large buyer under present-day conditions. In any case, so long as American blood stays American, in the face of practically a buying monopoly, such organizations are going to be.

What are the Functions of Dairymen's Organizations?

The first function of dairymen's organizations, of course, is to bargain as to price. Often it has been said that "the law of supply and demand must fix the price." But when the only buyer in a district offers a price to one producer here and another producer there, and only the buyer sees all the

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individuals and the individuals never see each other, is the law of supply and demand fixing the price or is the will of the buyer fixing the price? Before the law of supply and demand can be operative, the buyer and seller must each have alternatives and equal bargaining power. Under the conditions indicated above this is possible only when all the sellers sell as one man to the one buyer. The law of supply and demand pre-supposes competition among buyers as well as among sellers if a fair price is to be reached. But, as has been shown, the milk buyer now usually possesses a monopoly power which must be matched by the organized selling power of the producers. Otherwise, neither the consumer, the producer nor the dealer can know that the price is fair.

But there are numerous duties of dairymen's organizations, other than bargaining as to price. One is to get and maintain shipping facilities that many can secure which one cannot; another is to look after milk tests; another is to find and keep open the necessary markets. Much good is being done by such organizations, through coöperation with those who buy, to expand the market for milk by advertising and by creating and keeping good will. Then, too, net profits will increase by lowering production costs as well as by increasing selling prices. In feed and labor matters much can be and is being done by central organizations of dairymen. Furthermore, new markets must be found to meet new conditions.

All these and other functions are best rendered by

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the farmers themselves to the farmers themselves through their own representatives. Thus and thus only are the producers' interests fully protected.

Should these Organizations be Exempt from the Anti-Trust Statutes?

The purpose of the anti-trust statutes is to assure a fair price to the consumer and producer and dealer by keeping open the avenues of trade. The spirit of our institutions favors competition.

The essence of competition is the free bargain between a willing seller and a willing buyer. The seller is not a "willing" seller in any economic sense of the word unless his power to sell is equal to the power of the buyer to buy. This is possible as to milk under present milk-market conditions, only when the producers are organized. The same economic forces that our law-makers and courts recognized in collective bargaining for laborers argue for legalized collective bargaining for dairymen.

Moreover, the investment now necessary for milk distribution in a city of any size can be protected only if the owner thereof knows what his competitor is paying for milk. Otherwise price competition in the city is at the expense of the farmer and hence at the risk of a proper supply of milk for the consumer. The same forces that made it advisable that all railway rates be made public now make it advisable that the price paid for milk be made public.

But may the dairymen not abuse their freedom from prosecution for conspiracy to restrain trade?

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They may. The author has known of a few instances where the privilege of immunity from prosecution under the anti-trust statutes of a given state has been abused by the officers of a dairy organization. But when organized 100 per cent the power of the farmer is not greater than is the power of those to whom he sells before he organizes. We may by law enforcement prevent many farmers from coöperating to get a fair price. We cannot by any device known to law successfully prevent the few buyers in any one milk market from coming to a common understanding as to the price they will pay for milk, especially when the buyers are few and large investments are at stake. Shall we prohibit the farmers from combining to protect their interests when we cannot prevent the milk buyers from combining?

It is not advisable that either should be prevented. It is to the public interest that milk production should have the protection that can come only through equality of bargaining power. Moreover, it is to the public interest that the centralized power of the milk distributor be checked and balanced by an organization of equal power among producers. The abuses that may arise from collective bargaining may be checked in many ways. These abuses are neither so numerous nor so destructive as those that arise when dairymen are not organized, and the latter abuses cannot be checked by any means.

But, if collective bargaining is allowed, may we not have a great "producer-distributor" trust that would set its own prices without consideration of

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the interests of the consumer? Those who read the preceding chapters will learn of many forces other than bargaining power that really determine the price of milk. To be effective a "producer-distributor" combination would have to include not only a controlling number of all producers and all distributors, but of all manufacturers of milk products and of the producers and sellers of alternative foods to the extent that the price for such foods affect the price for milk. When such a combination shows promise, the proper agencies, mainly national and international, will soon be created to meet it. In such a combination the organized dairymen would be playing only a very small part.

Collective bargaining of any kind should be in the open and all agreements kept on record. Some of the essentials to this in milk prices are discussed in the chapter on "Coöperation and Price." The whole tendency of the times is to get fair prices through administrative supervision of price matters and not through the old, inept, ineffective judicial processes lamely attempting to prevent restraint of trade. The consumer's long time interests can be protected in ways other and more effectively (as shown in Chapter XII) than by preventing coöperative organizations among farmers through anti-trust statutes.

The truth is that exemption of such organizations from those statutes allows fair bargaining; the want of exemption compels unfair bargaining. For where there is no exemption the milk buyer either fixes his

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own price or he meets with the farmers to agree on prices only so long as it is to his own interests so to do. For, when it is not to the interests of the buyer so to do, the buyer pictures to the producer the penalties of the conspiracy statutes and names his own prices.

Under such conditions the American public will conclude to exempt bargaining associations of dairymen from anti-trust statutes.

CHAPTER VII

Policies of Dairymen's Organizations in Their Relation to Price

Certain questions as to the methods and policies of these organizations have such a direct bearing on price both to the farmer and to the consumer that it is well now to consider them. These questions are:

1. Around what market (local, primary, national or international) should these societies be organized?
2. Is the strike the method to be used to secure fair prices?
3. Can the interests of consumers be protected as well as the interests of producers and dealers?
4. Does the formula afford a practical method of price fixing?
5. Should such organizations own and operate their own receiving, distributing and manufacturing facilities?

1. Around What Market Should These Societies Be Organized?

The Chapter on "The Interdependence of Local, Primary, National and International Markets" depicts the degree of dependence and independence between each of these markets. As there pointed out, the primary market is the one that is most nearly independent of the other. Within a given

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primary market the competitive forces are such as to tend to make unity of price essential. As between primary markets there are seasonal and marketing conditions that necessitate price differences. The national and international markets blend into one during the season of plentiful production, because the sales value of manufactured products is to a large degree international.

These being the facts as to price forces in each of these classes of markets, it is clear that the type of organization that will best meet conditions is one independent dairymen's organization in each of the primary markets, these to be federated into a national (and in time international) organization that will meet the national and international issues on their merits.

The author has seen many instances when local organizations within a primary market have sought to maintain a price for whole milk for one town or city above the price prevailing in the primary market. The successes of those organizations have been transient. The very existence of such dairy organizations has depended upon the overshadowing protection of the larger organization in the primary market. Often such local associations have been harmful to the interests of even their own members. The unit is too small to be effective. One sound principle, alike of price or rate regulation as well as of collective bargaining, is that the regulating or bargaining power should be coextensive with the industrial organization to be regulated or bargained

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with. Thus state regulation of transcontinental carriers or city regulation of state-wide street railway systems inevitably prove to be impotent, or, if not impotent, unfair.

The "milk-sheds" separating the primary milk markets are known to the trade and can be easily observed. Often where the territories are not defined by transportation barriers there are customary divisions of territory among the milk purchasers, which afford a basis for a division of territory among dairymen's organizations. The primary market offers the only logical basis for separate dairy organizations.

It has been urged that these associations should unite into one national organization whose representatives would meet the representatives of milk purchasers monthly at some central place, such as Chicago, and then arrive at a base price for the United States as a whole, with customary or agreed differentials between the primary markets. The author has never believed that this plan was for the best interest of all parties for many reasons. Those who sell and those who buy, whether dealers or consumers, want to know that their "own people" are influential in price matters. Even if the price to the farmer were higher through a national price-fixing conference, there will be better satisfaction in the long run if these matters are determined at "home" by "home folks." The trade customs making a primary market for milk determine a primary market for other products and hence the

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people in these markets are "home folks" in a marketing sense. Accordingly the meeting held in these markets are sufficiently near "home" to satisfy all parties and allay suspicion as to unfair price methods or conclusions. Neither the farmers, the dealers, nor the consumers in Louisville, Kentucky, want their prices determined for them (however wisely or justly it may be done) in Cleveland. Nor will the citizens of New York want their prices arranged in Boston or Chicago. Moreover, those familiar with the forces in a primary market should bargain in that market. No "foreign" price will ever satisfy those who buy and sell on a primary market.

Differing climatic conditions and variation in producing or marketing output will necessitate a constant change in any system of price differentials between the primary markets.

"But," it is urged, "the butter, condensing and other milk manufacturers who have factories or receiving stations in the different primary markets play one low market against another to keep all markets down and hence the dairymen's organization in any one primary market is helpless to defend itself without help from similar organizations in other markets." In this argument there is much that is sound. A manufacturer with a receiving station in the Chicago district will not want to pay a higher price there than he pays at his receiving stations in the Los Angeles, Seattle, Pittsburgh or Boston districts, and he will make this clear enough by many means to the farmers in the Chicago district. It is

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to meet such conditions that a federation of dairymen's organizations is needed. In addition to organizations performing the many functions essential to each primary market, a central clearing house is needed to meet the joint needs of two or more primary markets. In the surplus production months this central organization might well assume advisory price functions, for in those months the price factors are largely national or international. In other words, the organization of dairymen's unions should be mobile enough to meet the needs of local, primary, national and international markets. A federation of the associations in the primary markets offers a type of organization adaptable to all these purposes. It is no accident that this is just the type that is now in operation.

2. Is the Strike the Method To Be Used to Secure Fair Prices?

Many questions of sales policies have been the center of public interest throughout the few years that dairymen have been organized. Dairymen organized to right wrongs. Often the "fire-eater" among the dairymen of a given district was chosen to represent that district. Force was the chief idea expressed and strikes were the first means used. So it was with labor organizations. The new labor union wants first of all to show its strength. The leaders of some dairymen's unions believe that strikes bring new members.

Contrasted with this view is the other policy, in

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the application of which the Philadelphia and Pittsburgh dairy groups are examples, namely, never to talk strike but secure results in other ways. Neither the milk producers nor the milk dealers have ever said they would never refuse to buy nor to sell but these ideas are never voiced in any of their price conferences. The idea of violence or of threat has been wholly absent in both these buying and selling groups. On the contrary each side assumes (and now believes) that the other wants a fair business settlement. The result: fair settlements are secured, not without much discussion, and sometimes only after much feeling is aroused, but for three years at least every price agreement has been unanimous and both sides have been convinced that the price was fair. The conclusion reached, both sides then co-operate to expand the market and to improve producing, buying and selling conditions.

Centuries of accumulated experience have taught all these in power in government or industry that the use of strikes or lockouts is an evidence only of the want of a higher ability on the part of those who use them. It may not be wise under some circumstances to advertise that these methods will never be used, but it is recognized that their use even if "necessary" is usually evidence of weakness and want of ability on the part of those who use them. The best labor leaders have for years stopped using violence and are finding more successful methods. For in any collective bargaining among equals, a point is reached sooner or later where the power is first with one

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group, then with the other. If one group abuses power when it has it, the other group will be inclined to do the same when in turn power comes to it. Therefore, when bargaining relations are to be permanent, as astute labor and industrial leaders recognize, force is never idly threatened and its use is accepted by the leaders themselves as evidence of poor leadership. Neither group will conclude never to strike nor to lockout, but they will conclude that these means prove destructive more often than they prove beneficial.

The need is to attain real equality in bargaining power. Power to bargain implies the power to refuse to buy or to sell. There can be no quibbling about this. The only question, therefore, is not whether dairymen shall never refuse to sell nor dealers refuse to buy but whether other methods will be exhausted before such refusal is made. Dairymen have been told so often what price they "can take or leave" that their first impulse is to do the same when power is in their hands.

In the chapter on "Coöperation and Price" a method of price agreement is described in which the power to refuse to buy or to sell including the power to name a price without a conference which the other must take or leave, gives way as a policy to mutual coöperation and understanding.

3. *Can the Interests of Consumers Be Protected as Well as the Interests of Producers and Dealers?*

Can farmers and milk dealers adopt price policies

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that will protect the consumers' interests as well as their own? The consumers' interests require a price that will maintain production and provide the costs and profits essential to the economical distribution of milk with adequate sanitary protection for the milk from the farm to the pantry. Because of the character of milk as a protective food, the consumer is also interested in a price as stable as producing conditions will warrant. In summer time the leafy vegetables may offer an adequate alternative to the protective food elements found most cheaply and surely in milk. But in the autumn and winter those leafy foods are high in price as well as scarce. Hence chief reliance in these months must be placed upon milk. From the point of view of social welfare, therefore, the price of milk in winter should not vary more from the summer price than is necessary to stimulate autumn production. Moreover, the resentment that a high seasonal price fluctuation brings to the consumer leads to cutting down the consumption of milk in winter. This does not mean exactly the same price to farmer or to consumer throughout the year, but it does mean that there are clearly defined points beyond which the price of milk to the consumer should not fluctuate as between winter and summer.

Thus, during the war period, consumption was not diminished by an increase of two cents per quart in the price of milk when the Food Administration said that that increase was fair, whether the increase was from twelve to fourteen cents or from thirteen to

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fifteen cents. Indeed, with the support of the Food Administration in many places, consumption was not reduced at all when such price increases were made. But a price increase in any one autumn or winter of as much as four cents per quart over the low price during the previous summer, however, has invariably met with distinct opposition and marked decrease in consumption. The only exceptions to this rule were the few months in the autumn of 1918 when the influenza epidemic was on—an exception that tends to prove the rule.

A stabilized price is essential to good loads on retail milk wagons and maintenance of equipment at full capacity, and these are the primary factors, both in keeping down costs to consumers, as will be shown later, and in assuring adequate annual profits to milk dealers.

Good health requires habitual use of milk and a habit of using milk keeps down the cost of handling milk per unit, thus stimulating consumption and increasing the farmer's market. A fairly uniform price is conducive to the habit of using milk.

This stabilizing of price to the consumer cannot be done without the coöperation of the selling organization among farmers. A short-sighted policy may lead farmers' organizations to whang prices as high as possible in the few months that milk is short, quite forgetting that when this is done it is but human and necessary for those who buy their milk to whang the prices as low as possible in the months when milk is plentiful. Quite forgetting, too, what is to their

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interest, that when milk consumption goes down because of extreme fluctuations in price, the number of months in which the farmers can control the whole milk market is to that extent lessened. Coöperation here between buyers and sellers will benefit both.

A monthly price distribution that stabilizes prices to the consumer is to the advantage of the producer who sells market milk. The new commercial possibilities in reconstituted milk will help stabilize the price. The use of powdered milk was in the author's opinion much lower the autumn of 1918 than it would have been had the government not taken practically all the supply for military purposes. Even as it was there was a large use of it. In its use lies the check to a monthly distribution in the future price to farmers that upsets consumption by necessitating abnormal seasonal increases in price.

Price stabilization to the consumer also means that the milk dealer in the summer time must have a spread wide enough to create reserves against the lean months of the autumn. This again necessitates close coöperation among dealers as well as between farmers and dealers, and between consumers and dealers. To this end, too, daylight delivery which satisfies laborers is a contributing factor.

Stabilization does not mean that, on a year round basis, the farmers with whole milk markets will get less for their milk; it means they will get more, for there is more milk produced in the spring and summer than in the autumn and winter months.

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The chart below shows the monthly distribution by per cents of the annual price that has actually prevailed for the periods noted in the New York, Philadelphia, Pittsburgh, and Chicago markets.

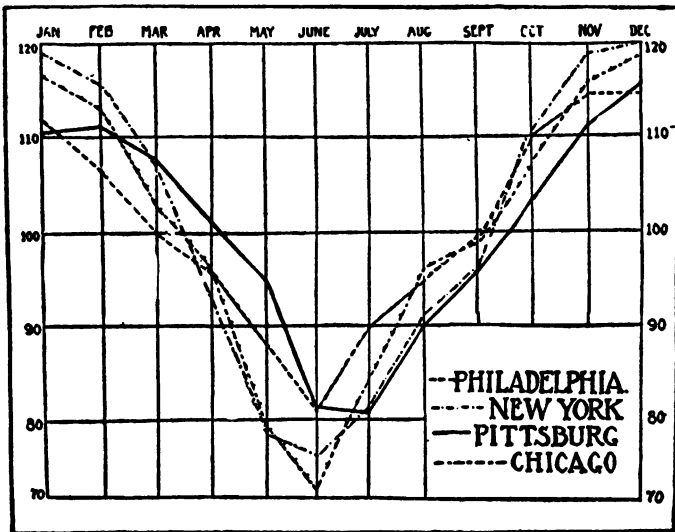


CHART No. XV.—THE AVERAGE MONTHLY VARIATION IN THE
AVERAGE ANNUAL PRICE RECEIVED BY MILK PRODUCERS
IN THE NEW YORK, PHILADELPHIA, PITTSBURGH¹
AND CHICAGO MILK MARKET DISTRICTS FOR
THE TEN-YEAR PERIOD ENDING IN 1916

An examination of this chart will show that the milk producers in the Philadelphia district through this ten-year period received a slightly lower price than producers in the other leading milk markets for January and December and a higher price in May,

¹ For nine years ending January 1, 1919.

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June and July. Inasmuch as much more milk is produced in the latter group of months than in the former group of months, the net annual money return to dairymen in the Philadelphia district has been as high as the net returns to dairymen in the other districts.

This market custom the producers in the Philadelphia district have kept during and since the war period. This constitutes their contribution to a favorable retail milk price situation in the Philadelphia district. Without this coöperation from the producers, Philadelphia consumers would have had to pay higher prices than they did pay in the fall and winter months and hope for lower prices in summer months. Under this latter plan the average paid by consumers for the year would have been higher even if the farmers' net returns had been the same, because of the upset business conditions for the city milk distributor. To accept this policy required faith by producers that public officials, milk consumers and milk buyers would not rush out to lower the price to the producer when they would have the power to do so in the season of greatest production to a point below that warranted by a fair consideration of sacrifices already made by the producer to stabilize prices to consumers. In other words, the producers had to refrain from "getting all they could get" when milk was scarce in return for assistance to maintain a fair average price through the rest of the year, especially during the months of greatest production.

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How this plan worked out in practice is shown in the chart below comparing the prices received by the milk producers at the country receiving station during the calendar year 1918 in the New York, Philadelphia, Pittsburgh, Cleveland and Chicago districts.

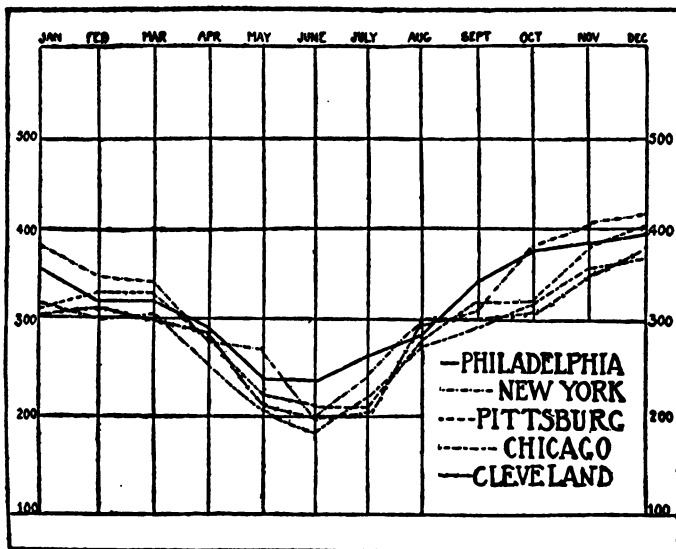


CHART No. XVI.—THE PRICE RECEIVED BY MILK PRODUCERS
AT COUNTRY RECEIVING STATIONS DURING 1918 IN THE
NEW YORK, PHILADELPHIA, PITTSBURGH, AND
CHICAGO PRIMARY MARKET DISTRICTS

As pictured by this chart, the annual price received by the farmers in the Philadelphia district in 1918 averaged as high as that received by producers in any primary milk market. Giving consideration

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to the higher price received by Philadelphia farmers during the seasons of greatest production, the milk producers in this district during 1918 received for the year as a whole the highest net money return received by producers in any primary market.

The risk taken by Philadelphia producers in thus helping to stabilize the price to the consumer is shown in the chart on page 156 comparing the prices received by Philadelphia producers from January 1, 1919, to June, 1920, with the price received in that year by New York, Pittsburgh, and Chicago producers.

An examination of this chart will show that for most of the year the monthly prices to producers in the Philadelphia district averaged well in 1919 with the monthly prices in other primary markets. In December, however, Philadelphia producers were receiving one cent per quart less than producers in the New York, Pittsburgh and Baltimore districts. The same inequity continued in January of 1920. In other words, the price to consumers in Philadelphia would have been one cent a quart higher than it was had those producing milk in that territory received as high a price as milk producers in other territories were receiving for those months.

Plans were made early in 1920 for maintaining the price paid to farmers in the Philadelphia district through which the price to the Philadelphia producers by June 1, 1920, averaged as high as that received by producers elsewhere on an annual basis. The price of milk to the consumer did not rise over 14

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cents per quart in Philadelphia as compared with a rise to 18 cents per quart in New York City.

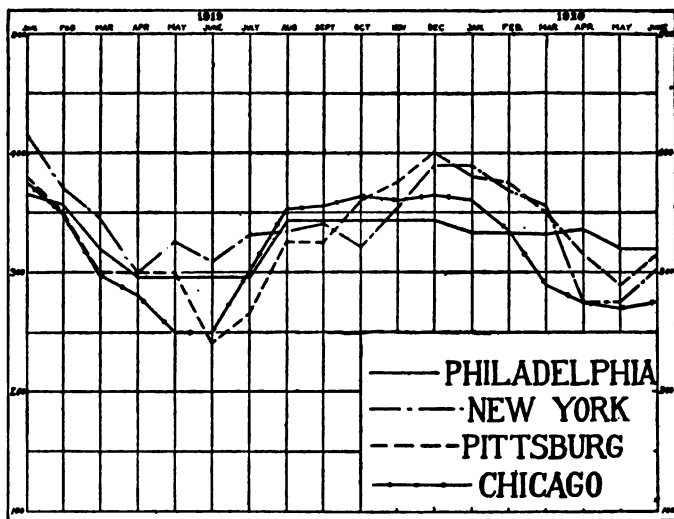


CHART NO. XVII.—PRICE PAID FOR MILK AT COUNTRY RECEIVING STATIONS IN THE NEW YORK, PHILADELPHIA, PITTSBURGH, AND CHICAGO PRIMARY MARKET DISTRICTS, JANUARY 1, 1919, TO JUNE, 1920

The price to the producer has been fairly stabilized in the Philadelphia and Pittsburgh markets. The price to the consumer has also been fairly stabilized. The result is a market wholesome for producers, satisfactory to dealers and a price fair to consumers.

One valid objection to price stabilization to producers is that the price to winter producers may not be sufficiently above the price to summer producers to encourage production in the seasons of

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greatest cost. To overcome this objection milk sellers and buyers in the Baltimore district worked out a plan for paying winter producers a higher price throughout all the season of plentiful production so that on the basis of the total annual income winter production would be maintained if not increased. Beginning in January of 1920, a similar plan was adopted in the Philadelphia district.

Under the Philadelphia arrangement the average monthly production of each producer for the months of October, November and December is taken as his "basic" production. For this amount of milk for each month thereafter the producer receives a "basic" price. He also receives the base price on 10 per cent above this average monthly production during May, June and July, and for 5 per cent above his basic output in August. Quantities of milk produced above these amounts receive a "surplus" price which is below the basic price. This surplus price is based on the daily average price of New York 92 score solid pack butter for the month preceding, plus 20 per cent. In this last named respect the Philadelphia plan differs materially from the Baltimore plan. In the Baltimore district the surplus price is determined by negotiations from month to month in which all factors figure, including the price of butter. In both plans new shippers come in during any month other than October, November or December¹ on the basis of 50 per cent surplus and 50 per cent basic.

¹ And September in the Baltimore District.

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To illustrate, farmer "A" produced 2100, 2000 and 1900 pounds of milk in October, November and December respectively. His basic production is 2000 pounds for these three months. In May he produced 2500 pounds. He receives the basic price for 2200 pounds and the surplus price for 300 pounds. If butter of the quality stated above averages 60 cents a pound in May he is paid for these 300 pounds at 120 per cent of 60 cents, or 72 cents per pound of his butter fat, or \$2.88 per hundred weight for 4 per cent milk at the receiving station door. The 20 per cent is allowed for overrun and the value of skim milk. The basic price has to be related to the value of milk both for whole milk consumption and manufacturing. The average of both must allow the average manufacturer to make a fair profit, otherwise he would be driven out of the territory. The plan for this reason is not adaptable to primarily manufacturing markets.

The basic price in the Philadelphia territory was \$3.61 from January 1 to June 1, 1920; the surplus price was \$3.12, \$3.18, \$3.19, \$3.43, \$3.00 and \$2.76 for January, February, March, April, May and June respectively, an average of \$3.11. With a surplus of one-third, the producer actually received for this period an average of \$3.46. The winter producer receives a higher average price, however, than does the producer in seasons of lower cost. The price to the consumer is stabilized with resultant advantages of a wider market to producers, a stable trade situation for distributors, a satisfactory price to

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consumers and a fair price to manufacturers. The longer experience of the Baltimore market and this season's experience in the Philadelphia market bear testimony to good results from this plan. Other organizations, such as the New England Milk Producers' Association, have adopted or are considering similar plans. The objections to the plan lie with the manufacturers. To meet these objections equitable considerations must be used.

It should not be inferred that the author recommends the Philadelphia plan for all districts or under all conditions. The Pittsburgh Plan is to negotiate each month's price, in conference, for all the milk as discussed in Chapter XIV. An examination of the three preceding charts will show that the price to producers in the Pittsburgh district has reflected normal market conditions and a wholesome variation between summer and winter costs. Pittsburgh is primarily a manufacturing district. Price stabilization to the consumer in the Pittsburgh district has been accomplished through a wider spread to the dealer in spring and summer than in the autumn and winter months, and through a variation of from one to two cents per quart between the price to the consumer in summer and in winter.

4. Does the Formula Afford a Practical Method of Price Fixing?

While the formula as described in Chapter V is valuable when used with other facts in gauging pro-

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duction costs, the use of a formula for actual price fixing *without any consideration of other factors* in milk prices is so silly that, if it were set to music, it would make good comic opera. Every business on any annual basis must pay its costs plus a profit. But what business man would succeed who attempted to distribute the prices at which he sold his goods exactly by per cents by months on the basis of what he had actually received on a ten-year previous average?

The advantages and limitations of the formula method for fixing prices are illustrated in the use of the Hoover hog price formula during the war period. In November of 1917, with the avowed purpose of stimulating production, assurance was given hog producers that, so far as the Food Administration could effect foreign buying of pork products, the Food Administration would endeavor to maintain a price per pound for hogs in the ratio to the price of corn of 13 to 1. This price stimulated hog production during the two years following. But peace negotiations and the approach of the armistice alarmed holders of corn, particularly because of statements receiving wide circulation at the time as to large accumulations of low-priced corn in Argentina and South Africa to be made available to the world's markets at once with shipping released. The result was a break in the price of corn of from 30 to 40 cents per bushel. This break (when incorporated in an average of the corn prices for the previous five months settled upon as a basis for calculating the

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price of hogs on the 13 to 1 ratio), indicated a fall in the price of hogs even though the price of corn should later rally. The rails were soon congested with hogs half fat and hogs not fit for market. The market in hogs taken alone did not justify such a break in hog prices. But with one of many price factors alone (corn price) determining hog prices and the market itself omitted, producers were justified in sacrificing their stock. A conference was held in Washington with the live stock committee and the formula abandoned as a sole factor in prices.

It is noteworthy in this connection that the formula method for price determination in milk was abandoned just as soon as the Food Administration was dissolved.

Something similar to this formula method in other industries is the sliding scale plan for regulating profits and prices in certain quasi-public utilities where there is a complete monopoly. Thus the Consolidated Gas Company of Boston was to have a profit of 7 per cent on an agreed valuation so long as gas sold at 90 cents per 1000 cubic feet to the consumer, but 8 per cent when gas sold at 85 cents and 9 per cent when gas sold at 80 cents per 1000 cubic feet.¹ Stockholders immediately interpreted this contract to mean that they were entitled to 9 per cent. The consumer received gas, therefore, at 80 cents. So far all were happy. The sequel is found in a report of the Public Service Commission of Massachusetts after the plan had been in oper-

¹ See King, Clyde L. "Regulation of Municipal Utilities." D. Appleton Co.

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ation a number of years. The managers of the plant could not maintain the plant in good condition, pay 9 per cent dividends and still sell gas at but 85 cents. They therefore robbed the plant. The public was finally presented with a plant worn out and obsolete, with the time-old query: "What are you going to do about it?" The plan failed because there was no such constant ratio as the formula necessarily assumed between operating costs and the price of the product.

A similar fallacy lies in the plan to create a separate wage board to state what shall be a fair wage to railway employees, leaving to another commission the power to state what is a fair rate. On the surface this seems fair. Are we to deny a fair wage to the employee or a fair rate to the companies? But if the sum of the two gives a rate more than the traffic will bear, what then? Continue to subsidize the two groups from taxation?

During the Food Administration a proposal, happily defeated, was persistently pushed whereby one department was to decide what was a fair price to milk producers, another the fair spread for milk distributors, the total to be the price to the consumer. "Are you to deny," it was argued, "cost plus a fair profit to producers or to dealers?" Certainly not. But what if the price to the consumer thus arrived at was more than both producers and distributors knew to be wise in order to keep their market wholesome? And what if consumers do not take all the milk offered at this "just" price? Are

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we to make up the deficits from taxation, thus doing away with all incentive to economies, to plant improvement, to elimination of useless costs?

Prices are not a simple case of mathematics.

Such are the limitations of the use of the formula method. Its advantages lie in its simplicity of application when the facts are agreed upon and in the foundation facts which, thanks to long years of patient research, the formula reflects concerning the amounts of feeds and of labor necessary to produce 100 pounds of milk in the cow factory. As a guide it is useful, and great credit is due to Professor Pearson and others who have made it practical.

By whatever method the cost of producing milk is reckoned, that cost alone is not the *sole* factor in determining the price at which it can be sold *for any given month*. If a farmer does get all his costs and a profit will he produce milk if he can produce some other commodity at a larger profit or secure a higher and better living standard in other work? Will one region stop producing milk because the living standards possible thereby are not as high as in other farming regions, though milk production offers the best returns of any product to the farmers in the first region?

Milk production costs and net returns are most valuable when they can be compared with the costs and net returns of other alternatives on the farm, and when they are compared with the net profits of the farm taken as a whole and with living standards possible to earners in other industries. Under cer-

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tain conditions it will pay better to plow clover under as a fertilizer than to make clover hay and feed live stock. Assuming that from both uses the farmer gets his costs and a profit, which he will follow if the one offers larger net returns than the other in the long run? With the same field crops the farmer has the choice of milk, beef and pork production. Assuming for each he can get back all his costs, which will he choose?

Here is a farmer in a good grain producing region. May he decide to keep a dairy herd sufficient to consume all his roughage and retain the fertilizer for his farm even though the daily net return derived from his work in the autumn and winter months may not be as large as the return from his labor at the seed time and harvest of his grains?

Will a farmer expect the same money wage for himself during the autumn and winter months that he will expect from his seasonal crops? The farmer living near a city will want a standard of wages and of hours for himself and his family comparable to those in the city. Does this standard reach back into the real dairy districts? Just how much is the time of the farmer worth during the six months that he is not planting or harvesting? What is the labor of his family worth at harvest times? At other times?

The principles concerned are similar (and no more difficult of application) than they are in determining the price for gas or electric current at "peak" demand. The price for "off-peak" demand is lower

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but yet this "off-peak" must bear a proper share of all the overheads and all direct labor costs. What this "proper" share is must depend upon whether the major portion of the business is in short hour residence lighting or in full day manufacturing. Likewise milk production, on a farm where the dairy is not the sole source of income, must bear its proper share of overheads and all the direct labor costs.

Dairying, when economically and wisely practiced, is intermixed with the system of cropping adapted to the neighborhood. In view of the most economical distribution of labor and the need for a cash income monthly, and in view of a hundred other factors that commingle to make farming the most exacting of sciences, the price for one product may be below cost and another above it, yet a combination of the two may still net the highest return. When the prices for a period are such as to discourage dairying for a period and the farmers turn to something else, more than cost plus profit will be needed to reestablish dairying in that district. It takes decades to train a whole community in the fine art of producing milk.

5. *Should Dairy Organizations Own and Operate Their Own Receiving, Distributing and Manufacturing Facilities?*

As to the questive of coöperation ownership, dairy organizations have had but little experience directly pertinent to the matter and of sufficient duration to be a real test.

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The best example of favorable results of coöperative ownership by dairymen of milk manufacturing and distributing facilities is the recent experience of the Associated Dairymen of California formed in 1917 from a federated association of eight units, or local associations. Several local units have since been added, and others are in process of formation. The central organization studies marketing in a broad way to help the local coöperative factories find the best outlet for their milk products. The milk factories themselves are operated by the local associations, although the central body is active in developing modern and uniform methods in all plants. By this means all factories are assisted in turning out a standard product, sale of which will be pushed by a wide campaign of advertising. To meet capital expenditures, dairymen members are assessed in proportion to the size of their herds, but operating expenses are paid out of receipts from the sale of the product.

The arguments for the coöperative ownership by dairymen of milk manufacturing and distributing facilities run as follows:

In the regions supplying whole milk markets, the surplus must be manufactured into milk products, the price for which is determined by a supply and demand over which the local farmers have no control. Inasmuch as the whole milk market offers the best price market, these surplus products must be either manufactured by the milk dealer at a loss to be underwritten by the consumer of whole milk as

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insurance for an adequate seasonal supply, or the price must come down to the level where milk can be profitably manufactured. The whole milk dealers, it is argued, use a small surplus to beat down the price on all the milk supply. This means an unfair price to the producers. Therefore, the producers, to get that price to which the price paid by the consumer fairly entitles them, and to get a price needed to compensate for the higher autumn and winter costs of producing milk for a year round market, must own the facilities for manufacturing their own summer surplus. Otherwise the "surplus" is forever fixing the price.

The argument for coöperative ownership and operation of milk manufacturing plants by the producers in districts primarily manufacturing, and for owning and operating the distributing systems in such districts, is chiefly to get all the market offers or can be made to offer from both the manufactured milk product and from the consumers of whole milk. Fundamental to belief in coöperative ownership is the recognition of the fact that the price to the farmer is what is left after the middleman's costs and profits have been taken from the consumer's price. The purpose of such ownership is to secure as large a share of those profits as possible for the producer.

All will sympathize with this point of view. The real question is whether a coöperative *sales* organization, or a coöperative *owning* and *operating* organization, or a combination of the two, will best secure

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these results. There are conditions under which such coöperative ownership and management will no doubt bring better net returns to milk producers than they are now securing. But under ordinary conditions the author concludes that best results will be secured through the coöperative *sales* organizations. The following facts and reasons compel one to such a conclusion:

In the first place investments are now in existence for the purpose of receiving and handling milk. These properties will either have to be duplicated or purchased. The wastes of duplication are apparent as shown by the history of not only gas, electric, street railway and other public utilities but by many private industries as well. To be run economically each milk plant must have that volume of milk essential to economical operation. Duplication prevents this and thus adds to the very cost of handling which the producer desires to lower by ownership.

If the properties are purchased, the poorly located plants will be on sale first at reasonable prices. If the poorly located plants are purchased, the producers are at once put at a disadvantage just because of their poor location. If the best located plants are purchased, the voluntary sale price (condemnation proceedings cannot be used) will include the earning power of this plant in relation to other plants which may or may not be desirable. For the farmers of any district or of any nation to put investments into such plants larger than are necessary in other districts or in other nations is to place such

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farmers at a distinct handicap in selling their products at a price that will maintain their investments.

To ruin existing investments by establishing competitive plants in order to purchase them at a more reasonable price or in order to force a manufacturer to "come to terms," is to launch on a policy that, to put it mildly, will have doubtful issue. Moreover, to be effective, coöperative investments of this kind must be sufficient to sell all the milk offered or manufacture it into that product which will bring the most favorable price. To do this is not as simple as it sounds. It seems easy to say to the milk purchaser: "Take what you want for sale to whole milk consumers at the price we set and we will handle all you do not want in our own plant or plants at our own cost and risks." But really to handle supplies advantageously is not easy. Is the plant to be maintained as a permanent plant or as an "emergency plant" solely? Is it to keep its own force all the time? Suppose the price should be high enough to stimulate greater production, is the dealer or the farmer to handle this excess supply? Will the whole milk dealer go beyond the district to get the milk he needs in the scarce season, thus avoiding the expense of surplus in the surplus season, placing that expense on the farmers? To be effective will the producers not have to own the plant equipment sufficient to care for all the milk of any primary market? Then what will be the relation of the price in this primary market to prices in other primary or national or international markets?

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The large condensing and butter interests today have receiving stations and manufacturing facilities in many primary markets. It is easy for these large concerns to keep the price to producers high enough in a local territory competing with a coöperative plant to ruin the coöperative investment. The large concern can make up any such local deficit by lower prices elsewhere. This producers cannot and will not do.

Nor is this all. Milk is most economically handled by that company equipped to turn to any product that at the time offers the best market. Creameries and milk distributing plants or ice cream plants are not most economically operated as independent units. The skim milk of the creamery can either be fed to hogs or made into casein or into various varieties of cheese; or it can be made into milk powders to store for making ice cream or whole milk later. With the sale of bottled milk retail can go the sale of butter, cheese, eggs, ice cream, and of sweet or sour cream. It takes a highly specialized milk marketing organization to get the best prices for all the milk products. The coöperative organization must compete with such organizations. This means highly specialized full time managers. To be sure farmers may employ these. The point is that the coöperative manufacturing plants must have output enough to make such employment economical.

A principle of law stipulates that he who buys on commission should not retail. The purpose of the

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law is to keep single the interests of the agent. If the agent is also a retailer he is no longer interested in gaining the highest price possible for those for whom he acts. In the same sense the selling agent of milk should remain solely a selling agent. When he also becomes a manufacturer his purposes are no longer single. He must make money on his manufactured products. This means a price to the producer low enough to allow him a profit on his manufactured products. If the agent is not as economical a manufacturer or as good a sales agent as professional manufacturers are, the members of the coöperative producers' organization must take the consequence either in lower prices for milk or in the risk to their investments. In the history that has led to the bankruptcy of many a coöperative concern lies eloquent testimony to this fact.

If it be well for producers to own and operate their own plants by all means such organization should be separate from coöperative selling organizations.

In the mind of the author the interests of all will best be served by a coöperative selling organization that sets out to use every avenue available in its district to sell the milk through the best existing avenues. A good marketing channel today or this season may not be the best the next day or the next season. For the present at least, full and complete utilization of the investments in existence offers a safe and permanent policy for organized dairymen. Exceptions to this rule will be made, of course, where a fair bargain can not be made. The facts

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as to the costs of manufacturing and distributing milk are now available and hence the fairness of the bargain as to prices on milk can be measured. If the producers can not get a fair bargain then they must own and operate their own manufacturing and distributing plants, as a last means of self-preservation.

Collective bargaining, as to milk prices, has come to stay. The policies adopted can be such that collective bargaining will protect at once the long time interests of efficient producers and distributors and likewise protect the best interests of consumers.

PART II

The Cost of Distributing Milk

CHAPTER VIII

The Cost of Milk Distribution

To understand the relative cost factors in milk distribution one must first review the steps in the process of getting milk from the dairy to the consumer.

Milk must be cooled on the farm. This cost the farmer usually stands, though sometimes a premium is paid by the milk dealer for milk properly cooled. Usually at whole milk receiving stations the milk is rejected if it is sour because it is not properly cooled, and in this way the farmer pays the cost of neglect for properly cooling his milk.

Transportation costs from the farm to the railway or receiving stations are commonly paid by the farmer. Sometimes, however, the dealer hauls the milk and deducts from the price to the dairymen this cost of hauling the milk. Because of the economies in hauling in larger quantities, the net hauling costs to the farmer when the milk buyer hauls the milk and deducts the cost therefor is lower than it would be if the farmer hauled his milk himself. Were this not the case the dairymen would continue to haul individually. To get the savings in larger loads many dairymen coöperate to hire their milk hauled or take turns in hauling it.

The hauling cost varies with the distance, quantity and character of the roads. For a twenty-mile haul

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a charge of from ten to fifty cents per hundred weight can be regarded as typical. The cans for this haul are usually owned by the farmers, though occasionally furnished by the dealer, in which case some allowance for this expense is deducted from the price to the farmer.

In general the costs borne immediately by the milk distributor begin at the country receiving station. Here the milk must be measured or weighed, tested for fat content, if bought on that basis, cooled and loaded into freight cars for shipment to the city.

The country milk station, in addition to being a center for receiving, cooling, canning and shipping milk, may also have the equipment necessary for one or more of the following services: separating cream, manufacturing butter, cheese, condensed milk, casein, milk sugar or milk powder. Occasionally these stations are equipped to pasteurize and bottle milk.

Then follows the freight or express charge to the city. The freight cars must be iced in many months of the year, a charge either borne directly by the milk company or included in the freight rates whether the rates be by the car load or for less than the car load.

Upon arrival at the city freight station, the cans must be unloaded into trucks or wagons and hauled to the bottling and pasteurizing plant. In rare instances the pasteurizing and bottling is done at the country plant. The larger city dealers now frequently maintain facilities at one or more of their

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country plants for manufacturing their surplus milk, though most dealers still provide such facilities at their city plants.

When the milk reaches the city plant it is unloaded upon a platform where it is weighed and tested, certainly for sourness, and increasingly for butter fat, if this test was not made at the country receiving station. Selected milks are set aside for their special uses. The milk is then clarified, pasteurized, chilled and bottled. Thereupon the bottled milk goes into a cold storage room until loaded on the retail or wholesale wagon for delivery. Laboratories, used for preparing certain modified milks, are an additional expense. Then there is the loss in broken bottles, the shrinkage in handling, the loss in sour milk returned, bad debts and the donations regarded as necessary to good will.

That portion of the price to the consumer that goes to the distributor for costs and profits is called the "spread." This word, however, is not always used to include the same costs. Sometimes it includes the costs from the time the milk is delivered to the receiving station until it reaches the consumer. The table on pages 178 and 179 gives for the New York City district for pasteurized milk by months for the year 1918: (a) the price to the producer 150 miles out (the point agreed on during that year, beyond which freight would be deducted and within which freight would be added) for milk testing three per cent butter fat, the basis to which the differential of 40 cents per 100 pounds is added to the producers'

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MONTHLY MILK PRICES SET BY THE FEDERAL MILK COMMISSION FOR THE NEW YORK DISTRICT DURING THE YEAR 1918

Months.	PRICE TO PRODUCER.				PRICE TO CONSUMER.				SPREAD TO DISTRIBUTORS ON RETAIL MILK.			
	For 3 Per Cent Milk.		Average for Butter Fat Test Paid For.		Grade "A" Milk.		Grade "B" Milk.		Grade "B" Milk on Quarts.		Grade "A" Milk on Quarts.	
	100 lbs.	Quarts.	100 lbs.	Quarts.	Quarts.	Pints.	Quarts.	Pints.	3 Per Cent Butter Fat.	Average Butter Fat.	3 Per Cent Butter Fat.	Average Butter Fat.
January.....	\$3.52	\$0.0750	\$3.84	\$0.0826	\$0.17	\$0.10	\$0.15	\$0.09	\$0.0750	\$0.0674	\$0.0950	\$0.0674
February.....	3.34	.0712	3.62	.0778	.165	.09	.145	.08	.0738	.0676	.0938	.0672
March.....	3.22	.0691	3.46	.0744	.165	.09	.145	.08	.0759	.0706	.0959	.0696
April.....	2.50	.0633	2.74	.0589	.16	.09	.14	.08	.0687	.0811	.1067	.1011
May.....	2.46	.0624	2.70	.0681	.16	.08	.13	.078	.0776	.0719	.0976	.0919
June.....	1.80	.0383	2.04	.0439	.15	.08	.13	.07	.0917	.0861	.1117	.1061
July.....	2.25	.0479	2.57	.0553	.15	.09	.13	.07	.0821	.0747	.1021	.0947
August.....	2.70	.0575	3.02	.0649	.15	.09	.14	.08	.0825	.0751	.1025	.0951
September.....	2.90	.0618	3.26	.0700	.16	.09	.14	.08	.0782	.0700	.0982	.0900
October.....	3.57	.0768	3.97	.0854	.175	.10	.155	.085	.0782	.0696	.0882	.0806
Effective October 15 th.....	.....	.....	.....	.....	.18	.11	.16	.10	.....	.....	.....	.....
November.....	3.81	.0819	4.21	.0905	.19	.12	.17	.11	.0881	.0795	.1081	.0995
December.....	4.06	.0873	4.42	.096	.19	.12	.17	.11	.0827	.0750	.1027	.0950

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MONTHLY MILK PRICE FOR THE NEW YORK DISTRICT—Continued

SPREAD TO DISTRIBUTORS ON WHOLESALE MILK.

Months.	Price by Dealer to Stores for Average Milk.		Price by Stores to Consumers for Average Milk.		Spread to Dealer in Sales to Stores (Dipped).		Spread to Stores on Dipped Milk on Basis of Average Butter Fat on Quarts.		Prices to Restaurants, per Quart.		Spread to Dealers on Hotel Milk.	
	Quarta.	Pinta.	Quarta.	Pinta.	3 Per Cent Butter Fat.	Average Butter Fat.	on Quarts.	Less than 10 Gallons or Over.	10 Gallons or Over.	3 Per Cent Butter Fat.	Average Butter Fat.	
January.....	\$0.135	\$0.07	\$0.15	\$0.08	\$0.06	\$0.0524	\$0.0274	.....	\$0.11	.....	\$0.0388	.....
February.....	.135	.07	.145	.08	.0638	.0572	.0322	.....	\$0.115	.....	.0409	.....
March.....	.135	.075	.145	.08	.0659	.0606	.0356	.11	.115	.....	.0467	.....
April.....	.13	.07	.135	.075	.0767	.0711	.0411	.10	.105	.....	.0426	.....
May.....	.12	.065	.125	.07	.0767	.0619	.0419	.095	.10	.....	.0367	.....
June.....	.115	.065	.12	.07	.0767	.0711	.0461	.095	.10	.....	.0367	.....
July.....	.115	.065	.12	.07	.0671	.0597	.0347	.09	.095	.....	.0421	.....
August.....	.125	.07	.13	.08	.0675	.0601	.0351	.095	.10	.....	.0375	.....
September.....	.13	.07	.14	.08	.0682	.06	.0400	.105	.15	.....	.0432	.....
October.....	.135	.075	.155	.085	.0572	.0490	.....	.....	.....	.....	.....	.....
Effective October 1st.....	.155	.....	.16	.....	.....	.....	.....	.....	.....	.....	.....	.....
November.....	.165	.....	.17	.....	.0654	.0645	.0495	.135	.1375	.....	.0381	.....
December.....	.165	.....	.17	.....	.0708	.07	.0450	.135	.1375	.....	.0381	.....

¹ These figures are prices from November 1 to 13, inclusive. The increase in price effective November 14 was due to increase in wages granted organized labor and to meet higher price to producers in next two months.

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price for butter fat; (b) the price the producer received on the basis of the actual butter fat content from month to month; (c) the price to the consumer for Grade "B" milk pasteurized, bottled and delivered to the door; (d) the spread to the dealer from the receiving station located just 150 miles out (the spread would be larger by the freight if beyond 150 miles and lower if within 150 miles) on the basis of (1) 3 per cent milk and (2) on the basis of butter fat actually paid for. The spread on the basis of the actual butter fat of the average of all milk is given also (e) for Grade "A" milk. Grade "A" is but a small percentage of all the milk delivered as the most of the milk sold in New York City is Grade "B." The price at which Grade "B" milk is sold loose to the stores, (f) and the price per quart, (g) at which this milk is sold dipped to the consumer by the stores is included as is (h) the price delivered to hotels and restaurants in can lots.

From 1901 to 1915 inclusive, the price of milk to the consumer in Philadelphia was 8 cents per quart. The following table shows for this period the proportion of this 8 cents that went to the dairyman and to the distributor. The price to the farmer is the price f. o. b. Philadelphia. The spread to the dealer in this instance is, therefore, for the costs and profits from the time the milk was delivered to the city until it was delivered to the consumer. Transportation, cooling and hauling costs should be deducted from the price given for the farmer in order to get the net price on the farm.

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During this period milk was not bought by test.

PROPORTION OF CONSUMER'S PRICE OF EIGHT CENTS PER QUART
THAT WENT TO THE FARMER AND TO THE DISTRIBUTOR
FROM 1901 TO 1915 INCLUSIVE, PHILADELPHIA

Yearly Average.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.
Price to farmer, f. o. b. Philadelphia.....	\$0.035	\$0.04	\$0.04	\$0.039	\$0.038	\$0.0408	\$0.043	\$0.038
Spread to distributor.....	.045	.04	.04	.041	.042	.0392	.037	.042

Yearly Average.	1909.	1910.	1911.	1912.	1913.	1914.	1915.
Price to farmer, f. o. b. Philadelphia.....	\$0.04	\$0.041	\$0.0408	\$0.0417	\$0.0404	\$0.0425	\$0.0425
Spread to distributor.....	.04	.039	.0392	.0383	.0396	.0375	.0375

The average spread to the milk dealer for these fifteen years was about four cents per quart. The spread was slightly more than this, as early in this period the producer was paid by dry measure and not by wet measure. During the year 1918 the spread was about $4\frac{1}{4}$ cents per quart, on the basis of the price to the farmer f. o. b. Philadelphia, for 4 per cent milk. During the early months of 1919 the spread to the Philadelphia dealer, on the same basis, was $4\frac{1}{2}$ cents per quart, an increase of one-half cent per quart, or $12\frac{1}{2}$ per cent over the pre-war period. This was on the basis of 4 per cent milk. The actual average butter fat of the milk received varied with the season from about 3.6 per cent to 3.8 per cent. During 1918 and 1919 the differential paid for butter fat in this district was 40 cents per 100 pounds.

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Hence the actual spread was more nearly $4\frac{1}{2}$ cents and $4\frac{1}{2}$ cents per quart, respectively, for the two periods given. This was an increase over the pre-war period of about 25 per cent. The significance of this relatively slight increase in the distributor's spread as compared with over a 100 per cent increase in price to the farmer, and as compared with the increase on other commodities during the war period is discussed in the following chapter.

Dr. Charles E. North has prepared the following tables comparing the increases by items in the costs of handling and distributing milk in New York City, and the increase in the spread to the distributor in that city for 1915 and 1918 respectively:

COST OF MILK HANDLING AND DISTRIBUTION, NEW YORK CITY

Item.	1915.	1918.	Per Cent Increase.
Freight.....	\$0.0093	\$0.0120	29
Handling.....	.0120	.0260	116 $\frac{1}{2}$
Distribution.....	.0238	.0404	70
Administration.....	.0032	.0040	25
Total per quart.....	\$0.0483	\$0.0824	

PRICE PER QUART OF MILK, NEW YORK MARKET

Date.	Paid Producer. ¹	Charged Consumer.	Spread to Dealer.
1915.....	\$03.66	\$09.0	\$05.34
1916.....	3.98	9.33	5.25
1917.....	5.82	11.96	6.14
1918.....	7.13	14.50	7.28

¹ This is for the 150 mile zone.

THE COST OF MILK DISTRIBUTION

This is an increase in the New York City district in spread to the dealer, from 1915 to 1918, of 36.3 per cent.

The table on page 184 gives an analysis for the periods, companies and districts named, of the cost reports made to the committee appointed to report to Food Administrator Hoover on the Production, Distribution and Food Value of Milk.¹ These reports were made by the dealers themselves, and the reports were audited by the accounting firm of Haskins and Sells, under the supervision of the author as chairman of the committee. The "factory" expense in this table is the average of the costs of handling, pasteurizing, bottling and cooling milk for the "whole milk" trade. "Selling" expense is the expense incident to selling all the milk purchased, whether as manufactured products or as whole milk. The "spread" in this table, therefore, differs in the items included from the "spread" for a strictly whole milk dealer. Special attention is called to the proportion manufactured in each of the districts in the table. Thus the "spread" in the Pittsburgh district (D) is primarily for manufacturing rather than for retail distribution.

Care must be used in comparing the dealers' spread in one city with the spread to dealers in another. Many a comparison is made that is not accurate. In the first place, care is needed to make certain that the spread given for each city includes the same cost factors. Very often an invidious

¹ For the names of those on this committee see footnote p. 109.

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THE AVERAGE COUNTRY, FACTORY, DELIVERY AND SELLING EXPENSES AND THE AVERAGE SPREAD
PER QUART TO CERTAIN MILK DEALERS ON ALL MILK HANDLED, WHETHER AS WHOLE MILK
(RETAIL AND WHOLESALE) OR AS MANUFACTURED MILK, IN TEN LEADING DISTRICTS OF
THE UNITED STATES FOR SIX MONTHS ENDED JUNE 30, 1917

	A ¹	B ²	C ³	D ⁴	E ⁵	F ⁶	G ⁷	H ⁸	I ⁹
Country expense.....	\$0.00606	\$0.00282	\$0.00239	\$0.00772	\$0.00789	\$0.00533	.....	\$0.00313	.....
Factory expense.....	.01024	.00697	.00646	.00397	.00801	.00654	\$0.00369	.00732	\$0.00626
Delivery expense.....	.02063	.01006	.01247	.00743	.01517	.00805	.00725	.01238	.00701
Selling expense.....	.00467	.00491	.00600	.00234	.00360	.00369	.0034	.00934	.00177
Net earnings.....	.00220	.00553	.00548	.00185	.00232	.00156	.00167	.00320	.00125
Total.....	\$0.04580	\$0.02829	\$0.03081	\$0.02331	\$0.03999	\$0.02537	\$0.01601	\$0.03537	\$0.01629
Average price received by dealer for milk.....	.09646	.08222	.07651	.06354	.08258	.08192	.06957	.08714	.04784
Average price to farmers.....	.05066	.05393	.04570	.04023	.04559	.05655	.04356	.05177	.03165
Spread retained by dealer.....	.04580	.02829	.03081	.02331	.03999	.02537	.01601	.03537	.01629
Ratio of net earnings to net sales (per cent).....	2.28	4.30	7.17	2.91	2.82	1.90	2.80	3.87	2.62
Number of quarts ¹⁰ purchased.....	223,066,168	10,979,796	77,962,041	43,828,743	67,607,377	6,468,708	30,327,505	20,479,020	19,548,298
Percentage of total purchased, sold as fluid milk.....	77.92	80.14	57.07	41.70	77.23	74.34	52.84	95.72	85.22
Percentage of total purchased, manufactured.....	22.08	19.86	42.93	58.30	22.77	25.66	47.16	4.28	14.87

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- ¹ DISTRICT A—NEW YORK CITY—METROPOLITAN DISTRICT. Reports from H. S. Charlevoixne (Inc.), Brooklyn; Cooke Milk and Cream Co., Brooklyn; Keystone Dairy Co., Hoboken, N. J.; Sheffield Farms Co. (Inc.); Mutual McDermott Dairy Corporation; Borden's Farm Products Co. (Inc.); High Ground Dairy Co.; Locust Farms Co., for six months ended June 30, 1917.
- ² DISTRICT B—NEW YORK STATE (EXCEPT NEW YORK CITY—METROPOLITAN DISTRICT.) Reports from Queen City Dairy Co., Buffalo; Geneva Milk Co., Geneva, N. Y.; White Springs Farm Dairy Co., Geneva, N. Y.; Little Falls Dairy Co. (Inc.), Little Falls, N. Y.; Cloverland Dairy Co. (Inc.), Syracuse, N. Y., for six months ended June 30, 1917.
- ³ DISTRICT C—CHICAGO, ROSEMONT, BALTIMORE AND WASHINGTON. Reports from the Bowman Dairy Co., Chicago; Alden Brothers Co., Boston; the City Dairy Co., Baltimore; Corbin Thompson-Sharon Dairy, Washington, D. C., for six months ended June 30, 1917.
- ⁴ DISTRICT D—PITTSBURGH. Reports from The McJunkin-Straight Dairy Co., Edward E. Rieck Co., Harmony Creamery Co., Ohio and Pittsburgh Milk Co., for six months ended June 30, 1917.
- ⁵ DISTRICT E—PHILADELPHIA. Reports from Scott-Powell Dairies, Harbison Dairies, Abbott's Alderney Dairies, Supple Milk Co., Dolinger Standard Dairies, Edward W. Woolman, Wills-Jones Co., for six months ended June 30, 1917.
- ⁶ DISTRICT F—NEW ENGLAND (EXCEPT BOSTON). Reports from Deerfoot Farms Dairy, Southboro, Mass.; The Bryant & Chapman Co., Hartford, Conn.; Somers Creamery Co., Springfield, Mass., for six months ended June 30, 1917.
- ⁷ DISTRICT G—MILWAUKEE. Reports from Gridley Dairy Co., Cedarburg Milk Co., Union Dairy Co., for six months ended June 30, 1917.
- ⁸ DISTRICT H—INDIANA (EXCEPT CHICAGO) IOWA, KENTUCKY, TENNESSEE, LOUISIANA, AND MISSOURI. Reports from Polk Sanitary Milk Co., Indianapolis, Ind.; Evansville Pure Milk Co., Evansville, Ind.; Cloverlands Dairy Co., New Orleans, La.; Nashville Pure Milk Co., Nashville, Tenn.; D. H. Ewing's Sons, Louisville, Ky.; Union Dairy Co., Rockford, Ill.; Des Moines Milk Co., Des Moines, Iowa; Pevely Dairy Co., St. Louis, Mo., for six months ended June 30, 1917.
- ⁹ DISTRICT J—OHIO. Reports from Licking Creamery Co., Newark; Akron Pure Milk Co., Akron; The Moores & Ross Milk Co., Columbus; Alliance Sanitary Milk Co., Alliance, for six months ended June 30, 1917.
- ¹⁰ Milk quarts embrace quarts of milk purchased as milk, whether disposed of as milk or converted into milk products; and for milk products (as cream, butter, cheese, etc.) purchased by the dealer in manufactured form, milk quarts represent the original quantity of milk from which such products were manufactured.

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comparison has been made between the spread of the dealers in Philadelphia and in New York City by comparing (a) the difference between the price paid to the farmer 150 miles out, for 3 per cent milk, and the price paid to the consumer in New York City with (b) the price to the farmer f. o. b. Philadelphia for 4 per cent milk with the price to the consumer in Philadelphia. The first "spread" includes, the second excludes, (1) the differences in price to the farmer, due to the agreed difference in the price of butter fat of 40 cents per hundred weight (nearly one cent per quart), (2) the freight on milk for 150 miles, and (3) the country receiving station costs. It is obvious that the only fair comparison is between the prices to farmers for milk of the same grade of butter fat at the same point, whether that point be the receiving station or the city platform, and the price to consumers for the same grade of pasteurized bottled milk delivered. When this is done the larger spread of from one to two cents per quart in New York City can be accounted for in most part by differences between distributing conditions such as the following: (1) In New York City about 35 per cent of the milk sold to dealers is delivered in bottles, retail to the consumer; in Philadelphia over 90 per cent of the milk is on the retail wagon. (2) In New York City, business rents may be higher than in Philadelphia. (3) Distributing conditions vary between the two cities in such matters as administration costs, sales methods, in capitalization, and particularly in the load on the retail wagon and in

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the length of haul. The skyscraper apartment house is a factor in New York City, while in Philadelphia it is not.

Similar differences exist as between other cities. Thus Pittsburgh is hilly, while Cleveland is level. The sanitary standard of the health department in Washington, D. C., requires heavier costs to the farmer and to the milk dealer than in other cities. Comparisons between the price to the consumer in Baltimore with the consumers' price in Philadelphia have failed to mention that for the same month Baltimore milk was averaging 4.2 per cent butter fat as compared with 3.8 per cent in Philadelphia. With butter at 70 cents per pound, this difference would make a cost difference of one-half cent per quart. Then again, Philadelphia dealers at that time were buying largely by weight, and Baltimore dealers largely by measure, which gave to the Philadelphia dealer an advantage of about one-fourth of a cent per quart. Labor and wage standards also differ in different cities. Most important, however, are the quantities on and the length of haul for retail wagons and the proportion of the milk that goes out on retail wagons as compared with the portion that goes through the grocery store as dipped or bottled milk. The relative amount of surplus milk is also an important factor in comparing costs in different cities or as between dealers in the same city. The author has found, also, a considerable difference in efficiency as between milk firms in different cities, in such matters as return of bottles, care of bottles in plant, manage-

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ment in loading and unloading wagons, competency of superintendents and of retail salesmen, difference in methods of collecting bills and substantial differences in the concept of what constitutes a fair profit per quart. Philadelphia and Milwaukee are among the cities particularly fortunate in the high standard of competency of their leading milk distributors.

From what has been pointed out thus far, it is clear that there is no one cost of distribution. Costs vary materially, not only between cities, but as between dealers on the opposite side of the same street. It must suffice, therefore, to include here three specific examples of cost items for selected dealers in three different cities, all for the periods stated.

The following are cost items for a company in a large city in the Mississippi Valley. The cost items are for the month of January, 1918. This company handled in that month 840,000 quarts of milk, of which 742,400 quarts were sold as whole milk and the balance manufactured.

General operating expenses:		Cost per Quart.
Supervision, receiving, weighing, can washing, pasteurizing, etc.	\$0.001483	
Power and refrigeration and maintenance. . . . .	.004323	
Bottle washing, bottling and capping. . . . .	.001127	
Bottles and caps. . . . .	.001118	
Total general operating expense . . . . .		.008051
Delivery expenses:		
Drivers and stablemen.015035	
Stable expenses and supplies.007290	
Total delivery expenses.022325

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Selling, administration and general expenses:	Cost per Quart.
Salaries of officers and clerks.	\$0.003533
Insurance, taxes and interest. . . . .	.001491
Stationery, printing, office supplies and expenses . . . . .	.001349
Advertising. . . . .	.001500
Depreciation on buildings and equipment. . . . .	.001255
Sales allowances. . . . .	.002076
Total selling, administration and general expense. . . . .	.011204
Total.	\$0.041580

The revenue and the items in the costs of delivering milk to consumers by retail milk wagons were found to be as follows for the calendar year 1917 for a large company in the East Central part of the United States. Manufacturing costs, wholesale delivery costs and the costs of the ice cream department are all taken out of all these illustrations. About 9,000,000 quarts of milk were retailed by this company during the period:

Distribution costs:	Cost per Quart Bottle.
Receiving station expense.	\$0.0057095
Freight. . . . .	.0041411
Loss in pasteurization. . . . .	.0011812
Pasteurizing. . . . .	.0050377
Bottling, washing and platform. . . . .	.0091408
Delivery. . . . .	.0220158
Collecting. . . . .	.0040432
General office. . . . .	.0043803
Publicity and sales. . . . .	.0012970
Auditing. . . . .	.0006179
Purchasing. . . . .	.0001152
Treasury. . . . .	.0000840
Administration. . . . .	.0022196
Expense of selling stock.0010652
Total cost of distributing quart bottle.	\$0.0610485

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Depreciation was charged in the above to operating costs as follows:

	Per Cent per Annum
Buildings, country.....	10
Buildings, city (brick).....	3
Buildings, city (frame).....	5
Equipment, country.....	10
Equipment, city.....	20
Wagons.....	10
Automobiles.....	20
Horses—value written off at death or at sale.	
Harness.....	10
Office equipment.....	5
Cases.....	24

The next is selected because it gives the proportional part going to wages for a large eastern milk company of high grade efficiency for the first six months of 1919:

	Cost per Quart.
Country expense:	
Wages.....	\$0.0016
Other expense.....	.0027
Total country expense.....	<u>\$0.0043</u>
Freight.....	<u>\$0.0061</u>
Milk cost, f.o.b. city.....	<u>.0844</u>
City plant expense:	
Wages.....	\$0.0063
Other expense.....	.0068
Delivery expense:	
Wages.....	.0118
Other expense.....	.0062
Administrative expense:	
Wages.....	.0019
Other expense.....	.0031
Total cost, country and city.....	<u>\$0.0861</u>

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To segregate out the costs of distributing milk from the costs of manufacturing milk products or of making and handling ice cream or of other businesses conducted by the same company requires answer to many questions similar to those that have for the while vexed rate-making tribunals. Thus electric companies for a while contended that their plants existed to serve residence and street lighting only; all other services were by-products that need carry only their direct operating costs but none of the overheads. This made the rates for residence and street lighting relatively much higher than rates to manufacturing companies. Similarly some milk dealers have contended that their whole business plant exists to serve the retail consumer and that bulk milk sold to hospitals and restaurants, or used for ice cream or butter or condensed milk or cheese, should bear none of the overheads but only their direct labor costs. The rule public service commissions soon enforced universally with electric or with other utility companies must be the rule with milk companies: each distinct class of commodities or services must carry their fair share of both overheads and operating costs. Whether allocation in the milk business is to be by values or by quantities or otherwise is a matter for judgment in a given case. But the general rule is clear—and very important to the consumer.

Similarly there are other questions as to valuations, apportionments of expenses to products and services, administrative salaries, good will, competency

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of management, etc., that are as pertinent and important in ascertaining a fair cost of distributing milk as in ascertaining a fair rate. Both require expert knowledge and equitable considerations.

The cost of distribution is as important to the farmer as to the consumer. The price to the consumer is the price to the farmer plus the cost of distribution; the price to the farmer is the price the consumer pays less the cost of distribution. The cost of distribution is therefore of public concern. Particularly so from the point of view discussed in Chapter XI: can these costs be lowered in fairness to the dealer as well as to the producer and the consumer?

CHAPTER IX

Sanitary Requirements in Their Relation to Price

Milk is the nation's food—or its poison. To make certain that milk is not a carrier of disease and to prevent its adulteration many statutory requirements have been adopted. Moreover, milk is an exceedingly perishable product. It spoils readily if not handled in a clean and sanitary manner and if it is not maintained at proper temperatures. To keep a fresh quality many public regulations are enforced.

Attempts to prevent adulteration of milk are very old. Mr. Henry N. Woolman¹ has pointed out that—

In France as early as 1396 an ordinance of the Provost of Paris dated November 25th of that year forbade the coloring of butter with "saucy flowers," other flowers, herbs and drugs. Old butter, likewise, was not to be mixed with new, but the sale was to be separate under penalty of confiscation and fine.

In 1412 the ancient laws of the merchant butter sellers and fruiterers of Paris confirmed the above provisions as to butter, and further forbade the sale of butter in the same shop in which fish were sold. There was a further provision that no butter should be sold by spicers, chandlers, apothecaries or other persons carrying on an "offensive" trade.

¹ In an address before the Eighth Annual Convention of the International Milk Dealers' Association.

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The oldest method of adulterating milk is the addition of water. If the water used is the carrier of any water-borne disease, such as typhoid or dysentery, such adulteration becomes inimical to health. If the water used is not the carriers of disease, such adulteration lowers the food value of the milk and sells water to the consumer at milk prices. For detecting such adulteration the "cream line" and the "appearance of the milk" used by the housewife are both deceptive tests. But by the specific gravity and other tests the addition of water to milk can be detected. Adulteration by adding skim milk or by subtracting the cream is more difficult to detect, as the ratio of fat solids in milk to solids not fat is not constant. The laws of the majority of the states, as does the pure food law of the United States, provide that no cream shall be removed from milk that is sold as whole milk. In addition the laws often provide minimum standards for the butter fat in milk.

These legal standards as to the minimum of butter fat permissible in milk sold as whole milk and not as skim milk are of little if any value. Some cows produce milk with a low butter fat content, often as low as 2.8 or 2.9 per cent. An examination of the tables on pages 223 to 234 will show that the legal standard set for the minimum of butter fat is 3 per cent in thirteen statutes and 3.25 per cent in twenty-four statutes out of the 43 national and territorial statutes with requirements on this point in June, 1919. Now, if the cow produces less than this

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standard the law provides either that the milk cannot be sold at all or that it can be sold only upon proof that it was the milk that did naturally flow from a given cow or herd. If the statute attempts the former, an injustice will be done those producers whose herds produce a milk of lower butter fat content than the statute permits to be sold. If the latter alternative is adopted, the law is of no avail, as it practically cannot be enforced. In either case the milk distributor can safely distribute milk that contains the minimum fat content provided by the statute. Hence the milk delivered to the consumer is often below the standard of the milk actually being given by the herds of the community as a whole.

Shall Standardization be Permitted?

Inasmuch as the milk of different herds varies in butter fat content, any milk dealer can set to one side the milk from the herds yielding the highest percentage of butter fat. The cream from these herds can be sold in preference to the cream of the lower producing herds. All milk dealers in practice thus "select" the cans of milk to be used for sale as whole milk or for other purposes. No public police surveillance of any kind can be of sufficient detail to prevent this. Moreover, no chemist can prove that skim milk has been put into whole milk, if the skim milk be added in reasonable quantities. And this for the reason that there is no constant ratio between solids not fat and fat solids not only

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as between cows in the same herd but as to the milk of the same cow on successive days. Therefore nothing can prevent the "standardization" of milk by some milk dealers through "selection" or otherwise.

By "standardization" is meant the lowering or raising of the butter fat content of the milk by subtracting or adding cream, or lowering the butter fat content and increasing the percentage of solids not fat by adding skim milk. Many a milk dealer who buys no cream still has plenty of cream to sell. That milk dealer, however, whose business would be hurt by publicity of such facts, cannot afford to take some cream from the milk he sells as whole milk. This will usually include any dealer with a considerable number of patrons who read the newspapers. The result is that the irresponsible dealer will "standardize" his milk while the responsible dealer will not take the risk.

The situation in the City of Baltimore at the time these lines are being written illustrates at once the problems at issue and their solution. The larger dealers of Baltimore are now buying milk on the basis of butter fat content. The farmers who sell and the dealers who buy on this basis have agreed to accept the tests of a certain laboratory as to what is the butter fat content of the milk of each herd. Thus the facts as to exactly what percentage of butter fat these milk dealers buy are open to all. It is easy to ascertain the butter fat content of the milk on the street. With such facts available the

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responsible dealer does not standardize. But the dealer whom publicity will not hurt in comparison with the profits obtained thereby is standardizing illicitly. At least one quart out of five now sold in Baltimore is thus standardized by reducing the butter fat content. The responsible milk dealer is subjected to an unfair competition from this trade. The health department does not, and cannot if it would, prevent this illicit tampering with milk content.

But under the existing milk ordinance in Baltimore the health department can state the conditions under which milk must be standardized if standardized at all. It can require, for instance, that all milk that has been standardized shall be marked "standard" milk, and that all milk so marked shall contain not less than 3.6 per cent or any other required percentage of butter fat. The milk on the streets of Baltimore for the responsible dealers now averages 4.2 per cent of butter fat. The resulting saving, if the butter fat required were 3.6 per cent, would reduce the price of whole milk, at the prevailing prices of butter, one-half cent a quart to the consumer—a saving that may be worth more to the consumer than the butter fat in the milk. Indeed, many a baby's milk is "modified" under a physician's orders so as to reduce the butter fat content of cow's milk down to the butter fat content in mother's milk. By permitting standardization, the plane of competition would be raised as between dealers and the consumer would get more cheaply just the food content of the milk really needed.

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The Commission on Milk Standards, appointed by the New York Milk Committee, in its report for 1917,¹ recommends that sellers of milk be permitted to sell milk as whole milk if it be unadulterated, provided it contains the minimum of butter fat and solids not fat required by law, or sell milk under a guaranteed statement of composition—that is standardized. If the dealer elects the latter the commission recommends: (1) that the dealer be required to state conspicuously on all containers the percentage of fat content to which the milk is standardized; (2) that this milk must contain a minimum of 8.5 per cent in solids not fat; (3) that the sale of milk on this guaranty system should be by special permission obtained from some proper local authority.

The author agrees with these recommendations except in one particular—as a matter of practical application he believes the public authority should permit standardization only to a given percentage of butter fat, preferably about 3.6 per cent, with a minimum requirement of 8.5 per cent in solids not fat and allow but this one grade of standardized milk to be sold. This will put public inspection and competition as to price by dealers both on a practical basis.

Uniformity in milk from day to day is essential to both the consumer and the milk distributor. The milk from one producer averages 4.5 per cent, another 4 per cent, another 3 per cent. Shall the milk

¹ Safe Milk Supplement No. 31. Public Health Reports, May 25, 1917, p. 7.

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of these several producers be bottled just as it chances to come along? If so, from the same dealer a given consumer will receive different grades of milk on different days. This is not in the interest of health nor of sales. The average dealer therefore runs the milk as it comes from different producers into large vats so as to get uniformity as between customers. Again, the process of bottling, unless watched, will cause a difference of as much as one-half of one per cent in the fat content of bottled milk.

In other words, the facts in the industry now require that we pass from the negative laws that vainly attempt to prevent the sale of milk below a stated minimum to laws requiring the dealer to sell milk of not less than a stated percentage of butter fat, adding cream if necessary to bring all the milk sold up to this point. The objection to this is that this may require "tampering" with milk. But inasmuch as milk is tampered with anyway, this objection largely falls to the ground.

Adulteration

One form of adulteration which food laws aim to prevent is the use of coloring agents to give milk the appearance of richness and to avoid detection when the milk has been skimmed or watered. For this purpose caramel, annatto and certain dyes are used, "none of which are particularly injurious in average amounts."¹ Chalk is probably never used for this

¹ *Ibid.*, p. 7.

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purpose, contrary to the common supposition, as it is so easily detected. Such fraud must have penalties prescribed by statute.

Formalin, borax, boric acid, and other antiseptics or germicides are used occasionally as milk preservatives instead of the true milk preservatives: proper cooling, cleanliness and proper and adequate distributing facilities. The dealer with a large trade will not dare to use these methods of preservatives or of adulteration because publicity of such methods would ruin his business. But, as in all food businesses, there are the few that use them. It is to prevent injury to health from the use of these preservatives that pure food and milk laws contain provisions providing penalties for their use.

Sanitary Standards

To prevent the spread of milk-borne diseases sanitary standards are required that are peculiar to milk. Milk is itself an ideal medium for the growth of bacteria. To this ideal medium, through carelessness in handling, may be added bacteria-carrying media, such as manure, hair, dust, flies and foreign material from human sources. It is not sufficient that this dirt be removed by a clarifier. The clarifier does remove visible dust and certain inflammatory products, including many harmful germs. But it does not remove all the disease producing-germs. Some kinds of bacteria in milk, such as the lactic acid bacilli, are harmless or even beneficial, while some are exceedingly dangerous.

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Among the diseases that may be conveyed through milk are tuberculosis, typhoid fever, septic sore throat, diphtheria, diarrhea, enteritis and the foot and mouth disease. The last named is not serious to the health of man, but it is to live stock.

"It is not unusual to find that as high as 10 per cent of market milk in some cities contains live tubercle bacilli.¹ Probably half of the cases of so-called surgical tuberculosis affecting children are due" to bovine bacilli. . . . "and some authorities estimate that at least 10 per cent of all tuberculous children owe their infection to this form of germ." In butter, cheese, cream and other dairy products these bacilli will exist for several months.

Milk is contaminated with typhoid germs through direct contact with some person who has the disease. The carrier of scarlet fever has never been isolated, but it is believed that the carrier of this disease gets into milk by careless coughing or sneezing by the milker and possibly from inflamed udders. Milk is a vehicle, though rarely, for diphtheria through direct contact with those who, though apparently healthy, have the disease. The foot and mouth disease is conveyed through milk or any of its products. Filth as well as bacteria in milk may cause diarrhea and enteritis. Similar symptoms may come from the abnormal conditions of cows. The carriers of septic sore throat get into milk both from the inflamed udders of diseased cows and from the throats of those who have the disease.

¹ *Ibid.*, p. 15.

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The means by which each of these diseases is carried is given because it is the way these diseases are spread that must determine the method to be used in preventing their spread through milk.

One method for preventing the spread of milk-borne diseases is inspection on the dairy farm; the other is pasteurization and inspection of the milk as delivered.

The present relative status of these two methods is shown by the following report of the Committee on the Control of Dairy Products of the Food and Drug Section of the American Public Health Association presented at the Chicago meeting in December, 1919:

Your Committee on Control of Dairy Products has deemed it wise to begin its survey of its field with the problems of milk control.

In this field it is confronted with the fact that there are two dissimilar theories of milk control. One, the older theory, maintains that the control should center around an inspection of milk as it is delivered to the consumer. This theory was dominant until about the beginning of the present century.

About 1900 the second theory became prominent. According to this theory milk could be best controlled by a supervision of the details surrounding its production, transportation and delivery. This theory soon became immensely popular, and its period of popularity was coincident with the great interest in dairy score cards.

During the past five years there has been a distinct and increasingly rapid swing of public

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interest back to the first theory—namely, that control can be best based upon an examination of the milk.

This latter change has been so rapid and so recent that it finds your committee somewhat divided between the two conflicting theories and even more divided as to the best manner of procedure in conducting a control of milk under the theory of inspection of the milk itself.

The committee has tentatively considered basing the control of milk upon the conception that the qualities to be desired in milk may be included under (1) food value, (2) healthfulness, (3) cleanliness, and (4) keeping quality.

While in the main favorably disposed toward the general plan as outlined above, it feels that sufficient exact information is not yet at hand to settle some of the differences of opinion which at present exist among its members, and it accordingly presents this as a report of progress.

(Signed) H. A. HARDING,
 R. S. BREED,
 H. W. REDFIELD.

Inspection of dairies is not a sure prevention. The tests, even for bovine tuberculosis, do not give 100 per cent guarantee that the cow tested surely does or does not have that disease. Neither does pasteurization for that matter, if improperly done, offer absolute protection. But pasteurization does offer a higher guarantee than does dairy inspection.

Milk is pasteurized by heating it to a temperature of 140° to 155° F., which is a temperature sufficient to kill the disease-bearing germs. The Commission

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on Milk Standards in the report referred to above recommends:

That the pasteurization of milk should be between the limits of 140° F. and 155° F. At 140° F. the minimum exposure should be 20 minutes. For every degree above 140° F. the time may be reduced by one minute. In no case should the exposure be for less than five minutes.

In order to allow a margin of safety under commercial conditions, the commission recommends that the minimum temperature during the period of holding should be made 145° F., and the holding time 30 minutes.

The commission thinks that pasteurization is necessary for all milk, excepting Grade A¹ raw milk. The majority of the commissioners voted in favor of the pasteurization of all milk, including Grade A raw, but since the action was not unanimous the commission recommended that the pasteurization of Grade A raw milk be optional. By the "flash" method the milk is heated to a temperature of from 160° to 165° F. in from 30 to 60 seconds, and then cooled immediately.

Many objections have been urged to pasteurization. One is that it gives to milk a "cooked" taste. But pasteurization does not give this taste unless the milk is brought to a temperature of 155° F. or above, and this is not necessary. Another is that the use of pasteurized milk may cause scurvy.

¹ For definition see footnote p. 222.

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Professor McCollum's conclusions as to boiled milk and as to pasteurization are:¹

Boiled milk has been extensively fed to infants in various parts of the world and in the experience of some observers does not induce scurvy. The experience of Hess further supports the view that boiled milk is less liable to induce scurvy than is milk which has been pasteurized at 165° F. or at a higher temperature. Milk which has been pasteurized at 165° F. is more liable to induce scurvy than either boiled milk or milk which has been pasteurized at lower temperatures, as 140° to 145° F. for thirty minutes. The most satisfactory explanation for these results seems to be found in the bacteriological condition of the milks treated in the various ways described. Heating milk at 165° F. kills nearly all the lactic acid forming bacteria which normally cause the souring of milk. Heating for thirty minutes at 140° to 145° F. leaves some organisms capable of development, and milk so pasteurized will sour. In the absence of the acid formers there develop during the interval between heating and consumption the spore-forming organisms which are not killed by pasteurization. These will, in time, cause the putrefactive decomposition of the milk. Any heat treatment which kills all the acid formers leaves the milk in a suitable condition for the development of the pernicious forms, and old milk so treated may be a menace to the health of infants and unfit for consumption by adults. Boiling tends to destroy all the organisms in milk and will do so if sufficiently prolonged. Such milk may be more suitable for food than that which has been so

¹ E. V. McCollum, "The Newer Knowledge of Nutrition," 1919, p. 101.

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treated as to prevent souring and yet be in a condition to permit the growth of putrefactive forms of bacteria. These results strongly support the view that there is a bacteriological factor involved in the causation of scurvy, and emphasizes the importance of securing clean milk, and of having it so handled as to insure its delivery in a good bacteriological condition. Milk should not be kept in the home without efficient refrigeration, and should be consumed before it becomes stale.

Pasteurization seems, in itself, to have little influence in lowering the food value of milk. The staleness is the great element of danger. Pasteurization is desirable as a safeguard against such diseases as typhoid fever, tuberculosis, scarlet fever and such organisms as cause epidemics of sore throat. It does not render milk permanently harmless. . . . Stale milk is dangerous, especially for use in infant feeding. In other words, the danger of pasteurization is more that people will keep the milk too long and use it because it does not "sour", inasmuch as the germs causing acidity were killed in pasteurization.

Says the Commission on Milk Standards in its report in 1917:

Scurvy and pasteurization.—The commission has assumed that the low temperature of 145° F. for 30 minutes as recommended by this commission for pasteurization destroys none of the food constituents of milk. Inquiry conducted by the New York City Department of Health into the records of the infant-milk depots, where sometimes over 25,000 infants are fed daily on pasteurized milk, appears to bear out this assumption. In view of the fact, however, that recent hospital experimental

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studies suggest that an exclusive diet of pasteurized milk may give rise to a subacute scurvy or similar nutritional disease in infants, which was entirely prevented, and even cured, by the feeding of orange juice, or other antiscorbutic food, the commission recommends that orange juice be added to the diet of infants that are fed on pasteurized milk. The commission wishes also to reaffirm its advocacy of the adoption of pasteurization by municipalities as a public-health measure.

Pasteurization is necessary to insure the protection of the consumers of butter from typhoid and tuberculosis. Mohler, Washburn and Rogers¹ state: "The work recorded in our investigations, as well as that by contemporaneous writers, proves that constant storage in icy temperature does not destroy the virulence of butter which contains dangerous tubercle bacilli."

If milk is pasteurized at a heat above 150° F., about 10 per cent less cream will rise to the surface than will rise in raw milk or in perfectly pasteurized milk. The higher "cream line" on milk thus improperly pasteurized has led some to believe that pasteurized milk has less cream than raw milk. This, of course, is not the case, as the heat essential to pasteurization in no way destroys fat.

Pasteurization of milk brought home from city plants is also necessary for the farmer. Even the skim milk from the common supply tank of the

¹ Mohler, John R., Washburn, Henry J., and Roger, Lore A., "The Viability of Tubercle Bacillie in Butter," United States Department of Agriculture B. A. I., Annual Report, 1909, pp. 179-191.

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butter factory taken home for feeding to animals on the farm should be pasteurized so as to make certain that it is not a carrier of tuberculosis or the foot and mouth disease.

Opposition to pasteurization is often based on the theory that the cost of pasteurizing equipment is such as to drive out the small dealer and favor the large dealer and thus make for a monopoly of milk distribution within the city. For reasons pointed out elsewhere there is a tendency for concentration of milk routes because of the economies in the larger retail loads. Other things being equal, the larger the volume of milk handled in the plant or on the retail wagon the lower the cost per quart in handling it. This is as true of pasteurization as of every other step in receiving, transporting and distributing milk. In other words, there are economies in handling larger quantities of milk. To this rule pasteurization is no exception. Just because the tendency for business men to get the savings in costs due to handling larger quantities of milk and the public tendency to make pasteurization compulsory developed at about the same time, it has been easy to conclude that the tendency toward larger milk businesses was due solely to the requirement for pasteurization. Such is not the case.

What compulsory pasteurization does often do is to prevent the nearby farmer from delivering his own raw milk direct to the consumer. In small towns in dairy regions this trade may be a significant price regulator. In towns or cities of any size, however,

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this type of trade is not a determining price factor. In any case the fewer the distributors the more certain the proper inspection of the quality of the milk they deliver, and the fewer the distributors the lower their unit costs and hence less competition from outlying farmers.

There are two reasons for pasteurization. One is to protect the health of those who consume it. Is this protection worth the cost? The other is the commercial advantage of handling milk from more distant sources. Is this commercial advantage worth the cost? This commercial advantage may be in the interests of the small dealer as well as the large, depending upon the source of the supply and the facilities for transportation of each. It is just as possible for the large dealer to have most of the nearby dairies with direct transportation facilities as for the small dealer to have them. With pasteurization the available market for the purchase of milk is widened.

What does it cost to pasteurize milk? Mr. John T. Bowen,¹ technologist for the Dairy Division of the United States Department of Agriculture, in 1917, made tests of the cost of pasteurizing the daily supply of milk in five city plants. He assumed a depreciation, including repairs, of 25 per cent on the pasteurizing equipment, such as pasteurizers, vats and coolers, that had to be daily taken apart and cleaned; and 10 per cent for depreciation and repairs

¹ "The Cost of Pasteurizing Milk and Cream." Bulletin No. 85, United States Department of Agriculture.

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on other machinery such as engines, boilers and shafting. The cost assumed for coal was \$4 per ton. Interest on investment was estimated at 6 per cent per annum. The hourly wage for labor is not stated. The number of pounds pasteurized at each of the five plants, the number of hours taken for pasteurizing this amount, and the cost per gallon was:

	Plant Number.				
	1	2	3	4	5
Time of operation (hours).....	4.366	8.216	2.0	4.0	3.6
Number of pounds of milk pasteurised.....	40,577	20,236	7,628	29,799	22,055
Cost of pasteurizing, per gallon.....	\$0.00229	\$0.00262	\$0.00436	\$0.00251	\$0.00337

The average cost for the five plants was .00313 cent per gallon, or .00078 cent per quart. The three companies whose costs were below this average (.001229, .00262 and .00251 cent respectively) were those that pasteurized the larger quantities. Yet the cost to company "3" was but a small fraction of a mill per gallon above that of company "5" which pasteurized three times the quantity of company "3." The same author found the cost of pasteurizing cream to be .00634 cent per gallon, or .0756 cent per 100 pounds. This would amount to about two-tenths of one cent for each pound of fat, calculating 35 pounds of milk fat in 100 pounds of cream.

Other things being equal, the larger volume the lower the cost per unit in pasteurizing milk as in other costs of receiving, handling and distributing

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milk. But the differences in the cost of pasteurizing alone is not sufficient of itself to cause concentration.

Were pasteurization not required to protect the public health, many firms would still pasteurize for commercial reasons. In the same sense hygienic and sanitary conditions in the dairy pay the farmer in the longer lives of the herds and in the larger volume of milk that will be produced with the same feed from cows kept under hygienic conditions. A small-mouth milk can is as advisable for milk for the pigs as for city consumers.

There are other costs also that are really incident to proper sanitary requirements. Among these are refrigeration, bottling, and bottle and can washing. Yet these costs, too, are incident to the necessity of "package" delivery. A neat, clean, sterile container is as advisable commercially for milk as for the articles delivered from the city store. The washing and sterilizing of milk cans has a commercial value as well as a value in protecting health.

The up-to-date milk plant will, as a sanitary precaution, have all the air thoroughly washed that comes into the rooms where milk is handled, in order to keep out the street dust. This, too, is an expense, as is the assurance of absolute purity of the supply of the water that comes in contact with milk containers.

While these services to protect milk cost money, yet the costs of meeting proper sanitary requirements by the milk dealer and the milk producer are not prohibitive and do not add unduly to the cost of

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milk. In some places a premium is paid for milk produced under hygienic conditions. Thus one dealer in Washington, D. C., pays a premium of one cent a gallon for tuberculin tested milk and a premium of one-half cent, one cent and one and one-half cents per gallon for milk produced under conditions where the barn score is 75 to 80, 80 to 85, and 85 or more, respectively. This brings a better tasting product and a product easier to handle commercially. In other places the premium for milk produced with good barn scores amounts to about ten cents per hundred pounds, or less than three mills per quart. The total cost for all purposes for protecting herds and live stock, for hygienic conditions on the farm, for refrigeration in transit, for pasteurization and for refrigeration in delivery total around one cent per quart, a portion of which is for business advantage and a portion incident to the proper protection of the public health.

Shall Licenses be Required from Milk Producers?

The objection to reliance solely upon inspection of dairy herds and barns to protect the wholesomeness of milk is that few cities have the inspectors necessary, and those that have an adequate number of inspectors, do not have inspectors with the proper qualifications, too often because the salary paid is too low to attract the technical talent necessary. But quite outside of this there are so many ways of circumventing inspection that the method is unreliable at its best and adds heavily to the cost of the

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consumer. Washington, D. C., offers an illustration of this. It was the duty of the author during the early winter of 1918 to advise the Food Administrator of the District of Columbia on matters pertaining to milk prices in the District. The author found in his investigations that the standards set for the District requiring inspection and permits for all dairies sending milk into the District did add to the cost of the milk to the consumer in ways additional to the cost of the service. For instance, the best dealers paid a premium to farmers who had satisfactory barn scores. This cost money, both to administer and in the production of the milk. Other dealers did not go to these costs—but they kept the same price to the consumer as those that did. In a statement appearing in the newspapers of the District on March 31, 1919, Health Officer Fowler, said:

The health department is in full sympathy with the licensed farmer who has to compete with his unlicensed neighbor and is doing all it can to protect them, but feels that its position in this matter should be clearly understood by all concerned.

It is admitted that milk from unlicensed farms has been and is still being brought into the District of Columbia, but it is not being brought into the District with the permission of the District authorities. The health department has resorted to every means at its command to prevent this unlawful practice and has consistently brought proceedings against all dealers who have been detected in engaging in such practice.

It is much regretted, however, that the depart-

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ment has met with little success in getting these cases before the court for final disposition. As an evidence of the activities of the department in the enforcement of the milk law, forty-five cases, involving twelve separate dairymen in this city, most of them being large distributors, are now awaiting trial before the court. On or about January 30th a local dealer was tried before a jury in police court for bringing milk from an unlicensed farm into the District of Columbia, and was adjudged guilty. His attorney, however, by resorting to certain legal procedures, has thus far been able to prevent the imposition of the deserved penalty.

The statement that "dealers who procure their milk supply from properly licensed farms are penalized, since other dealers who compete with them are permitted to bring milk into Washington from uninspected sources" is equally a misstatement of facts. Among the forty-five cases now awaiting action by the court, some of the largest dealers in Washington are involved. These dealers not only obtained milk from licensed farms, but have also obtained it from unlicensed farms as well, mixing the products of the two farms at their respective dairies in this city. The one thousand gallons of unlicensed milk which has been referred to in the public press recently was brought into Washington by a dealer who obtains his supply from both licensed and unlicensed sources.

The licensed dairy farmer or producer is also not entirely blameless in the matter of milk from unlicensed farms being brought into the District of Columbia, as the health department is in possession of information tending to show that some

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producers operating under a license issued by the health department allow their unlicensed neighbors to use their cans (the licensed shipper's) and to ship the unlicensed product as a part of the milk supply from the licensed farm.

The requirement of a license from producers as a prerequisite to selling milk in some instances may be and has been used to limit supply for the purpose of securing more or less of a monopoly price. The following is taken from a Washington, D. C., paper the day after the statement by Dr. Fowler appeared as quoted above.

(2) MILK DEALERS ARE PROSECUTED

Producers' Association Plan for Enforcement of Law Brings Results

Prosecutions were initiated yesterday by the District health department against two prominent milk dealers on charges of having violated the law forbidding the bringing into the District of milk from unlicensed dairies. The evidence was collected and the warrants made out and signed within the single day, which is said to be record time.

Three prosecutions have been instituted since Saturday. This action follows a resolution passed last week by the executive committee of the Virginia and Maryland Milk Producers' Association, appealing to the District authorities to enforce the law, as it caused them heavy losses to be obliged to compete with unlicensed producers.

Professor H. A. Harding of the University of Illinois, chairman of the Committee of the American

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Public Health Association, quoted above, sums up the present tendency as to the best methods of sanitary control of milk as follows:

"It is apparent to any one familiar with the milk business that the conditions surrounding the production of milk may change twice a day, and those surrounding its transportation and distribution at least once a day. Under the most generous appropriations available to any of the larger cities it has not been possible to inspect the conditions surrounding production more than once in three months and more frequently this inspection has not averaged more than once a year. Under such circumstances any genuine application of the theory of official supervision of the details of production is manifestly impossible.

Sanitarians as a class are not more deficient in common sense than other people and they gradually became conscious of the situation. New York City, which was early the leader in farm inspection, was one of the first to frankly abandon it, at least so far as it applied to ordinary market milk. In discussing the matter with the Health Commissioner of one of our next largest municipalities, he said frankly that he considered farm inspection as camouflage. The chief dairy inspector from one of the states where the state dairy inspection is at its highest efficiency, said recently that, while he formerly considered them as very important, it had been a long time since he had paid much attention to dairy farm score cards.

Much similar evidence might be presented to show that the theory of official supervision of the details of the milk business has had its day, and now the tide is setting strongly toward the theory

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that official control of milk supplies should rest upon an examination of the milk as it is delivered to the consumer as far as it is possible to adequately protect the consumer by such an examination. It seems an easy and safe prediction that during the next ten years the controversies in milk control will range around the question as to what are the examinations which will best accomplish this object. At the same time the milk dealers should appreciate that as the health officials relax their efforts to directly stimulate the producer, the responsibility for so doing will fall entirely upon the distributors. This is a responsibility which they must accept and should discharge creditably.

Wholesomeness of milk is even more important than its food value. The word wholesome means not merely pure milk, but milk that invites drinking because it tastes so good. The first prerequisite to wholesome milk is that it be promptly cooled. This prompt cooling widens the farmer's market by making the milk taste better and lowers costs by reducing waste. The prompt cooling and proper handling of milk on the farm makes money for all farmers and saves money and ill health to all consumers.

The less milk is handled by human beings and the more it is handled by machines that can be sterilized, the fewer the possibilities of contamination, the fewer the centers of contagion, the purer the milk supply. Hence milk should go direct from farmer to consumer through sterilized equipment, free from the touch of human hands and from the dust of the cities; for the city dust of today is made up of the

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spittings of yesterday. To put this point another way, milk should be taken through receiving stations subject to inspection, transported under refrigerated conditions, and delivered (refrigerated, pasteurized, bottled) to the consumer's doorstep; never out of controlled conditions and not subject to work done by hand. Happily, this policy means not only pure milk and wholesome milk, but milk at a lower cost per unit, for reasons pointed out elsewhere.

Inspection of dairy herds and barns helps the farmer protect his own herds and his own family and improves the quality of the product he has to sell. By improving quality he expands his market.

But inspection of dairies can never be so complete as really to safeguard the supply of milk.

The qualities of milk needed when delivered to the consumer are: food value, healthfulness, cleanliness, keeping quality. The first is assured by the test of fat content and of milk solids other than fat; the second by prompt cooling on the farm, and by pasteurization; the third by sediment tests; the last by prompt cooling with proper refrigeration from the farm to the consumer.

The question is not as to whether pasteurization can dispense with hygienic conditions surrounding the production, transportation and distribution of milk, but whether sediment, acid, bacterial and similar tests of milk as delivered, just because they can be used effectively, get a more wholesome milk than does inspection on the farm just because dairy inspection cannot be done effectively.

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The best public policy is to use each of these methods for the ends which each is peculiarly adopted to achieve. Daily tests of milk as delivered to the consumer will point to the places in plants or in dairies or in transit where the milk may be contaminated or improperly kept. Inspection of plants and of dairies can then be made to find and check the causes for unwholesome milk. The dairy inspector can help the dairyman in a business way by assisting him to improve the hygienic conditions surrounding his herds and the sanitary conditions under which his milk is cooled, kept and delivered. The inspector can help the dealer in his plant. In these ways inspection costs can be kept as low as consistent with a pure milk supply without undue interference with the price for milk. Under this plan a license is not required from the producer before he is allowed to sell milk. But the producer or distributor that knowingly violates health standards is denied a market.

To prevent duplication the city and state inspectors must coöperate. When several cities get their milk supply from the same territory it is better for the inspectors to be under state employ in order to get uniformity and to avoid duplication.

Standards for Milk Inspectors

A survey made before the war by Dr. Ernest Kelly of the United States Department of Agriculture as to the salaries paid to inspectors in 31 of our states and 102 of our cities showed that the highest

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salary paid for milk inspectors was \$1800 by the states and \$2100 by the cities, the lowest salary being \$1000 and \$720 by states and cities respectively. The average salaries for these inspectors was \$1352.16 for the states and \$1208 for the cities. But half of these employees were under civil service. Both the tenure of office and the general lack of prescribed qualifications indicated that those who did milk inspecting were, as a rule, not expert. As a result of this survey "The Committee on Methods of Appointment of Dairy and Milk Inspectors and their Compensation" reported to the International Association of Dairy and Milk Inspectors¹ the following recommendations:

1. Cities and States should strive to employ only men who can devote their entire time to dairy and milk inspection.
2. No dairy or milk inspectors should be employed who derive any private income from the persons with whom they deal in their inspection work.
3. Salaries should be paid to dairy and milk inspectors commensurate with the training and experience necessary for properly performing the work.
4. Dairy and milk inspectors should be protected by civil service laws against removal except for cause.
5. Civil service requirements should recognize the fact that special education and training are not only desirable, but necessary in a candidate for appointment.

¹ At the Fifth Annual Convention held in Springfield, Mass.

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6. Dairy and milk inspectors should be agricultural college graduates or should have at least attended such an institution, or institutions of similar rank, long enough to have acquired a working knowledge of dairy sanitation, bacteriology and chemistry.

7. It is very desirable that inspectors should have had practical experience in at least one branch of the dairy business, so that they are familiar with trade practices and the problems with which they will be constantly confronted.

If it costs money—as it does—to make and keep milk a wholesome food, the obvious plan is not to prevent wholesome milk because of the costs but to adopt those public policies that will lower not only these costs but all costs of distribution, and to make certain that those who need milk get it through the proper channels. The Food Administration of Pennsylvania, during the war period, appointed a committee of one representative from each of the charitable organizations in the city to make certain, both that there was not useless duplication in giving milk by charity organizations to those who needed it, but could not pay for it, in whole or in part; and to see that all got milk who needed it. No one, rich or poor, can afford to buy unwholesome milk, no matter how cheap it is.

Milk not up to the proper sanitary standards should be so classified under public regulations and sold only for the limited purposes for which it is properly useful. Under present conditions at least two grades of milk should be provided for in our

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cities: a grade of raw milk and a grade of pasteurized milk. In addition a grade of "standardized" milk may be permitted as discussed above.¹

¹ The Commission on Milk Standards takes the following position as to grades of milk:

GRADES OF MILK

The commission believes that all milk should be classified by dividing it into three grades, which shall be designated by the letter of the alphabet. It is the sense of the commission that the essential part is the lettering, and that all other words on the label are explanatory. In addition to the letters of the alphabet used on caps or labels, the use of other terms may be permitted so long as such terms are not the cause of deception. Caps and labels shall state whether milk is raw or pasteurized. The letter designating the grade to which the milk belongs shall be conspicuously displayed on the caps of bottles or the labels of cans.

The requirements for the three grades shall be as follows:

Grade A

Raw Milk.—Milk of this class shall come from cows free from disease, as determined by tuberculin tests and physical examinations by a qualified veterinarian, and shall be produced and handled by employees free from disease as determined by medical inspection of a qualified physician, under sanitary conditions, such that the bacterial count shall not exceed 10,000 per cubic centimeter at the time of delivery to the consumer. It is recommended that dairies from which this supply is obtained shall score at least 80 on the United States Bureau of Animal Industry score card.

Pasteurized Milk.—Milk of this class shall come from cows free from disease as determined by physical examinations by a qualified veterinarian, and shall be produced and handled under sanitary conditions, such that the bacterial count at no time exceeds 200,000 per cubic centimeter. All milk of this class shall be pasteurized under official supervision, and the bacterial count shall not exceed 10,000 per cubic centimeter at the time of delivery to the consumer. It is recommended that dairies from which this supply is obtained shall score at least 65 on the United States Bureau of Animal Industry score card.

Grade B

Milk of this class shall come from cows free from disease, as determined by physical examinations, of which one each year shall be by a qualified veterinarian, and shall be produced and handled under sanitary conditions, such that the bacterial count at no time exceeds 1,000,000 per cubic centimeter. All milk of this class shall be pasteurized under official supervision, and the bacterial count shall not exceed 50,000 per cubic centimeter when delivered to the consumer.

It is recommended that dairies producing grade B milk should be scored, and that the health departments or the controlling departments, whatever they may be, strive to bring these scores up as rapidly as possible.

Grade C

Milk of this class shall come from cows free from disease, as determined by physical examinations, and shall include all milk that is produced under conditions such that the bacterial count is in excess of 1,000,000 per cubic centimeter.

APPENDIX TO CHAPTER IX

Legal Standards for Dairy Products

(Reprinted from a Report to the Secretary of Agriculture.)

By GEORGE B. TAYLOR and HARRY N. THOMAS,
Market Milk Specialists, United States Department of Agriculture.

Summary: A majority of the States report standards for milk of 3.25 per cent milk fat and 8.5 per cent solids not fat. The standards for total solids vary between 11.5 and 12 per cent. Ten States have bacterial standards for milk. Skim milk has a generally recognized standard for total solids of 9.25 per cent, while 18 per cent butter fat in cream is almost universal, although one State reports a 15 per cent standard and another a 22 per cent standard. Two States report standards for light and heavy cream.

A majority of the States report an 82.5 per cent milk fat standard for butter. A peculiar situation exists in that where this standard is made directly by legislative action it is almost always 80 per cent. On the other hand, where authority to make standards is delegated to food control officials, the standard for butter fat is almost invariably 82.5 per cent.

For condensed milk and cheese the United States Department of Agriculture standards are generally accepted.

California, Indiana, Nebraska, Oklahoma and Oregon report State compulsory pasteurization laws for market milk. California, Nebraska and Oregon exempt milk from herds free from tuberculosis.

Indiana, Oklahoma and Tennessee require all products entering into the manufacture of ice cream to be pasteurized. Oklahoma requires "all milk bought to be resold" to be pasteurized. Minnesota, Colorado, Iowa, Maryland, Michigan and Pennsylvania require skim milk from creameries to be pasteurized.

All milk of this class shall be pasteurized, or heated to a higher temperature, and shall contain less than 50,000 bacteria per cubic centimeter when delivered to the consumer.

Whenever any large city or community finds it necessary, on account of the length of haul or other peculiar conditions, to allow the sale of grade C milk, its sale shall be surrounded by safeguards such as to insure the restriction of its use to cooking and manufacturing purposes.

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Thirty-eight cities report compulsory pasteurization of market milk in the absence of State laws on this subject.

Twenty-one States and Territories report that standards for dairy products are obtained by direct act of legislature; departments in twelve States have used authority granted by their legislatures, and have made all dairy standards; in fifteen States standards are made, both by act of legislatures and food control or other departments under legislative authority. Four States or Territories report that they have no legal standards for milk and milk products.

Pasteurization of market milk is compulsory in the following cities and states:

Cities

Altoona, Pennsylvania.

Ann Arbor, Michigan.

Anniston, Alabama.

Atlanta, Georgia—for Grade B milk.

Baltimore, Maryland—except selected raw milk.

Birmingham, Alabama—except Grade A raw.

Buffalo, New York.

Charleston, South Carolina.

Chicago, Illinois.

Cleveland, Ohio.

Cumberland, Maryland—unless cows are free from tuberculosis.

Dayton, Ohio.

Detroit, Michigan—except certified and Grade A.

East Orange, New Jersey.

Elyria, Ohio.

Evanston, Illinois.

Findlay, Ohio.

Grand Rapids, Michigan—except certified, and dairies with tuberculosis—free herds and scoring not less than 75.

Hamilton, Ohio.

Jersey City, New Jersey.

Lansing, Michigan—unless cows are free from tuberculosis.

Minneapolis, Minnesota.

Newark, New Jersey—except Grade A and certified.

New York, New York—except Grade A raw.

Newport, Rhode Island—except certified milk.

Norwood, Ohio.

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Oklahoma City, Oklahoma—for dairies scoring less than 70.
Philadelphia, Pennsylvania.
Richmond, Virginia.
Rochester, Minnesota—unless cows are free from tuberculosis.
Rock Island, Illinois.
Saint Louis, Missouri—except special grade of milk.
Sandusky, Ohio.
Seattle, Washington—unless cows are free from tuberculosis.
Spartanburg, South Carolina.
Tacoma, Washington—unless cows are free from tuberculosis.
West Orange, New Jersey—except certified milk.
Wheeling, West Virginia.

States

California⁵
Indiana⁹
Nebraska⁵
Oklahoma¹⁷
Oregon⁵

Minnesota requires skim milk from creameries to be pasteurized at 180° F.

Tennessee requires pasteurization of milk products used in the manufacture of ice cream.

Pasteurization Temperatures

Arizona.....145° F. for 30 minutes.
California.....140° to 145° F. for 25 minutes.
Delaware.....145° F. for 30 minutes.
Indiana.....145° F. for 30 minutes or 160° F. for 30 seconds.
Massachusetts.....140° to 145° F. for 30 minutes.
Nevada.....140° F. for 25 minutes or 170° F., flash method.
New York.....142° to 145° F. for 30 minutes.
Oklahoma.....145° F. for 25 minutes or 150° F. for 20 minutes
or 170° F., flash method.
Oregon.....140° F. for 30 minutes.
Tennessee.....145° F. for 30 minutes or 165° for 30 seconds.
Vermont.....145° F. for 30 minutes.
Washington.....140° F. for 25 minutes.
Wyoming.....145° F. for 30 minutes or 165° F. for 30 seconds.

These standards were established in the manner indicated under the heading "Standards Established by" in the tables.

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STANDARDS

(Numbers in parentheses refer to Notes.)

States.	Milk.			Skim Milk.	Cream.	Standards Established by
	Per Cent Total Solids.	Per Cent Solids not Fat.	Per Cent Fat.	Per Cent Total Solids.	Per Cent Fat.	
Alabama.....	..	..	..	..	..	No State standards.
Alaska.....	..	..	..	..	..	No Territorial standards.
Arizona.....	..	8.5	3.25	9.25	18	Act of legislature.
Arkansas.....	..	..	..	..	..	No State standards.
California.....	11.5	8.5	3	8.8	18	Act of legislature.
Colorado.....	..	..	3	..	..	Act of legislature.
Connecticut.....	11.75	8.5	3.25	..	..	Act of legislature.
Delaware.....	..	8.5	3.25	..	18	State Board of Health under legislative authority.
Dist. Columbia.....	12.5	9	3.5	9.3	20	Act of Congress.
Florida (3).....	..	..	..	..	..	Legislature provides for adoption of Federal standards.
Georgia.....	11.75	8.5	3.25	9.25	18	State Veterinarian under legislative authority.
Hawaii.....	11.5	8.5	3	..	18	Act of legislature and Food Department under legislative authority.
Idaho.....	11.2	8	3.2	9.3	18	Act of legislature and by Public Welfare Department under legislative authority.
Illinois.....	..	8.5	3	9.25	18	Act of legislature and Food Standard Commission under legislative authority.
Indiana.....	..	8.5	3.25	9.25	18	Act of legislature and State Board of Health under legislative authority.
Iowa.....	11.5	..	3	..	16	By act of legislature and Dairy and Food Commission under legislative authority.
Kansas.....	..	8.5	3.25	9.25	18	State Board of Health under legislative authority.
Kentucky.....	12	8.5	3.25	(3)	18	State Board of Health under legislative authority.
Louisiana.....	12	8.5	3.5	8	18	Act of legislature and State Board of Health under legislative authority.
Maine.....	11.75	8.5	3.25	..	18	Act of legislature

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STANDARDS—Continued

(Numbers in parentheses refer to Notes.)

States.	Milk.			Skim Milk.	Cream.	Standards Established by
	Per Cent Total Solids.	Per Cent Solids not Fat.	Per Cent Fat.	Per Cent Total Solids.	Per Cent Fat.	
Maryland. . . .	..	8.5	3.25	9.25	18	Legislative act provides for adoption of standards and definitions under United States Food and Drugs Act.
Massachusetts .	12	..	3.35	9.3	15	Act of legislature and State Board of Health under legislative authority.
Michigan.....	11.5	8.5	3	..	18	Act of legislature.
Minnesota.....	13	..	3.25	..	20	Act of legislature and State Dairy and Food Commission under legislative authority.
Mississippi....	(3)	(3)	(3)	(3)	18	Law provides for adoption of Federal standards.
Missouri.....	12	8.75	3.25	9.25	18	Act of legislature.
Montana.....	11.75	8.5	3.25	..	..	Act of legislature and regulations of Dairy Commissioner under legislative authority.
Nebraska.....	..	..	3	9.25	18	Act of legislature and Food, Drug, Dairy and Oil Commission under legislative authority.
Nevada.....	(3)	(3)	(3)	(3)	22	Legislative act provides for Federal standards.
New Hampshire	11.85	(12)	3.35	8.50	18	Act of legislature and State Board of Health under legislative authority.
New Jersey....	11.5	8.5	3	..	16	Act of legislature and Food Department under legislative authority.
New Mexico....	..	..	..	..	..	No State standards.
New York.....	11.5	..	3	..	18	Act of legislature and Public Health Council under legislative authority.
North Carolina	11.75	8.5	3.25	9.25	18	State Agriculture Department under legislative authority.
North Dakota .	(15)	..	..	..	18	Food Department under legislative authority.
Ohio.....	12	9	3	..	..	Act of legislature.
Oklahoma.....	12	8.5	3.5	..	18	State Board of Agriculture under legislative authority.

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STANDARDS—Continued

(Numbers in parentheses refer to Notes.)

States.	Milk.			Skim Milk.	Cream.	Standards Established by
	Per Cent Total Solids.	Per Cent Solids not Fat.	Per Cent Fat.	Per Cent Total Solids.	Per Cent Fat.	
Oregon.....	11.7	8.5	3.2	..	18	Act of legislature.
Pennsylvania..	12	(18)	3.25	..	18	Act of legislature.
Philippine Isl..	11.75	8.5	3.25	(3)	18	By Health Department under legislative authority.
Porto Rico....	(3)	(3)	(3)	(3)	(3)	United States Food and Drugs Act and Board of Health under legislative authority.
Rhode Island..	12	..	2.5	..	18, 40	Food and Dairy Departments under legislative authority.
South Carolina.	11.5	8.25	3.25	..	..	Act of legislature.
South Dakota..	11.75	8.5	3.25	9.25	18	Act of legislature.
Tennessee.....	..	8.5	3.25	..	..	Act of legislature.
Texas (3).....	..	..	..	..	..	Food and Drug Department under legislative authority.
Utah.....	12	8.8	3.2	9	<div style="display: inline-block; vertical-align: middle;"> <div style="display: flex; align-items: center;"> <div style="margin-right: 5px;">{</div> <div style="display: flex; flex-direction: column; align-items: center;"> <div>18</div> <div>24</div> <div>30</div> </div> <div style="margin-left: 5px;">}</div> </div> </div>	Act of legislature.
Vermont.....	11.75	8.5	3.25	9.25	18	Act of legislature and State Board of Health under legislative authority.
Virginia.....	11.75	8.5	3.25	..	18	Food Department under legislative authority.
Washington....	..	8.5	3.25	8.8	18	Act of legislature
West Virginia..	12	..	3	..	16	Public Health Council under legislative authority.
Wisconsin.....	..	8.5	3	9	18	Act of legislature.
Wyoming.....	..	8.5	3.25	9.25	18	Dairy, Food and Oil Department under legislative authority.

Note: The standards in the above table and in the table following were obtained through questionnaires and personal letters sent out by the Dairy Division of the U. S. Department of Agriculture from April to July, 1919.

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STANDARDS

(Numbers in parentheses refer to Notes.)

States.	Butter.		Condensed Milk.				Ice Cream.		Cheese.	
			Sweetened.		Unsweetened.		Per Cent Fat.		Per Cent Fat.	
	Per Cent Fat.	Per Cent Moisture.	Per Cent Fat.	Per Cent Total Milk Solids.	Per Cent Fat.	Per Cent Total Solids.	Plain.	Fruit or Nut.	Whole Milk.	Skim Milk.
Alabama.....	..	..	..	..	..	..	..	..	..	..
Alaska.....	..	..	..	..	..	..	..	..	..	..
Arizona.....	80	16	7.7	28	7.7	28	10	8	50	..
Arkansas.....	..	..	..	..	..	..	..	..	..	..
California.....	80	..	(3)	(3)	(3)	(3)	10	8	50	(4)
Colorado.....	80	16	7.7	28	7.7	24	10	10	50	(6)
Connecticut.....	..	..	..	..	..	..	8	6	..	..
Delaware.....	..	..	..	..	..	..	..	..	..	..
Dist. of Columbia	83	12	..	..	..	..	..	..	..	..
Florida (3).....	..	..	..	..	..	..	..	..	..	..
Georgia.....	82.5	..	..	..	..	..	8 (8)	8	50	..
Hawaii.....	(3)	..	(3)	(3)	(3)	(3)	14	12	(3)	(3)
Idaho.....	82.5	..	7.7	28	7.8	34.3	14	12	50	..
Illinois.....	82.5	..	8	28	7.8	25.5	8	8	50	..
Indiana.....	82.5	16	(3)	(3)	7.8	25.5	8	8	50	..
Iowa.....	(3)	..	(3)	(3)	(3)	(3)	12	10	(3)	(3)
Kansas.....	80	16	8	28	7.8	25.5	14	12	50	..
Kentucky.....	(3)	16	(3)	(3)	(3)	(3)	14	12	(3)	(3)
Louisiana.....	82.5	16	8	28	7.8	25.5	10	8	..	..
Maine.....	..	..	..	..	..	..	14	12	..	..
Maryland.....	82.5	..	8	28	7.8	25.5	4	4 (10)	50	..
Massachusetts...	(3)	..	(3)	(3)	(3)	(3)	7	7	(3)	(3)
Michigan.....	80	..	(3)	(3)	(3)	(3)	10	8	30	*
Minnesota.....	..	16	8	28	7.8	33.3	12	12	..	..
Mississippi.....	82.5	..	8	28	7.8	25.5	12.5	10	50	..
Missouri.....	82.5	16	8	28	8	28	8	8	50	..
Montana.....	82.5	16	..	..	..	..	10	9	50	25
Nebraska.....	14	12
Nevada.....	(3)	(3)	(3)	(3)	(3)	(3)	(3)	..
New Hampshire...	80	16	(3)	(3)	(3)	(3)	14	14	(3)	(3)
New Jersey.....	82.5

* Under 30;

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STANDARDS—Continued

(Numbers in parentheses refer to Notes.)

States.	Butter.		Condensed Milk.				Ice Cream.		Cheese.	
			Sweetened.		Unsweetened.		Per Cent Fat.		Per Cent Fat.	
	Per Cent Fat.	Per Cent Moisture.	Per Cent Fat.	Per Cent Total Milk Solids.	Per Cent Fat.	Per Cent Total Solids.	Plain.	Fruit or Nut.	Whole Milk.	Skim Milk.
New Mexico.....	..	..	..	..	..	..	..	..	..	..
New York.....	..	..	8	28	7.8	25.5	..	..	13 (14)	18
North Carolina....	82.5	16	8	28	..	..	10	8	50	..
North Dakota.....	..	15	(3)	(3)	(3)	(3)	10	10	(3)	(3)
Ohio.....	..	..	..	25% of T.S.	..	..	..	..	30	under 20
Oklahoma.....	82.5	16	..	..	..	..	10	8	..	..
Oregon.....	80	16	..	..	7.8	25.5	8	6	50	..
Pennsylvania.....	..	..	..	..	..	..	..	..	32	(19)
Philippine Islands	82.5	..	8	28	7.8	25.5	14	12	50	(3)
Porto Rico.....	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Rhode Island.....	84	16	(3)	(3)	(3)	(3)	..	..	..	..
South Carolina....	..	..	..	..	..	..	8	..	..	..
South Dakota.....	80	..	7.6	28	7.6	28	14	12	50	..
Tennessee.....	..	..	..	..	..	..	8	8	..	..
Texas (3).....	..	..	..	..	..	..	..	..	..	..
Utah.....	80	16	7.8	..	7.8	25.5	14	12	(3)	(3)
Vermont.....	82.5	..	(3)	(3)	(3)	(3)	14	12	(3)	(3)
Virginia.....	(3)	16	(3)	(3)	(3)	(3)	8	8	50	..
Washington.....	80	..	7.8	25.5	7.8	25.5	8	8	50	(20)
West Virginia.....	..	..	..	..	..	..	8	8	..	..
Wisconsin.....	82.5	..	8	28	8	28	14	12	50	..
Wyoming.....	82.5	16	7.8	34.3	7.8	25.5	14	12	50	..

Bacteria Standards

The only States that have adopted bacteria standards are the following:

California.—In milk, as Note (1); cream, as Note (2).

Delaware.—In milk, 100,000 per c.c.; cream, as Note (7).

Georgia.—In milk, 500,000 per c.c.

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Hawaii.—In milk, 1,000,000 per c.c.
Idaho.—In milk, 500,000 per c.c.; cream, 500,000 per c.c.
New Hampshire.—In milk, 500,000 per c.c.
New York.—In milk and cream, as Note (13).
Oklahoma.—In milk, as Note (16).
Porto Rico.—In milk, 100,000 per c.c.
Vermont.—In milk, 200,000 per c.c.
Washington.—In milk, 400,000 per c.c.

Notes

- (1) Grade A, raw—less than 100,000 bacteria per c.c.
Grade A, pasteurised—less than 200,000 bacteria per c.c. before pasteurisation; less than 15,000 after pasteurisation.
Grade B—less than 1,000,000 bacteria per c.c. before pasteurisation; less than 50,000 after pasteurisation.
- (2) Not more than two times the bacteria in the corresponding grade of milk.
- (3) United States Department of Agriculture Standards.
- (4) Half skim, 25 per cent fat.
- (5) Unless milk is from herds free from tuberculosis as evidenced by the tuberculin tests.
- (6) Less than 50 per cent of total solids.
- (7) Raw cream—less than 500,000 bacteria c.c. Pasteurised cream—less than 250,000 bacteria per c.c.
- (8) Bacteria standard for ice cream is 500,000 per c.c.
- (9) Compulsory pasteurisation of milk products entering into the manufacture of ice cream.
- (10) Fruit ice cream, 4 per cent fat; nut ice cream, 6 per cent fat.
- (11) Skim milk from creameries required to be pasteurised to 180° F.
- (12) "By terms of law enacted in 1917, provision is made for the sale of milk, provided that such be 'pure natural milk' and that 'every can, bottle, or other container in which such milk is shipped, sold or delivered, at wholesale or retail, is plainly labeled so as to show its guaranteed composition.' "
- (13) Grade A, raw:
Milk—not more than 60,000 bacteria per c.c.
Cream—not more than 300,000 bacteria per c.c.
Grade A, pasteurised: (Milk or cream before pasteurisation, not more than 200,000 bacteria per c.c.)
Milk—not more than 30,000 bacteria per c.c.
Cream—not more than 150,000 bacteria per c.c.
Grade B, raw:
Milk—not more than 200,000 bacteria per c.c.
Cream—not more than 750,000 bacteria per c.c.
Grade B, pasteurised: (Milk or cream before pasteurisation, not more than 1,500,000 bacteria per c.c.)
Milk—not more than 100,000 bacteria per c.c.
Cream—not more than 500,000 bacteria per c.c.
- (14) Cheese made from skimmed or partially skimmed milk must be branded with the words, "Skimmilk Cheese"; if it contains 13 per cent milk fat or over, it may be branded, "Medium Skimmilk Cheese", or if it contains 18 per cent of milk fat or over, it may be branded "Special Skimmilk Cheese."

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- (15) Normal milk with no fat or solids removed and no adulteration.
- (16) "Bottled raw milk must not contain more than 100,000 bacteria from May 1 until October 1. All pasteurized bottled milk more than 50,000 in the same period of time. . . ."
- (17) "All milk and cream used in manufacture of creamery butter and ice cream for commercial purposes, and all milk bought to be resold, must be pasteurized. . . ."
- (18) "If a person accused of violating section one of this act shall furnish satisfactory affidavit that nothing has been added to or taken from the milk in question, which is otherwise pure and wholesome, and is not below three (3) per centum of butter fat . . . no prosecution shall be instituted against said person."
- (19) Cheese—Full cream, not less than 32 per cent butter fat.
Three-fourths cream not less than 24 per cent butter fat.
One-half cream not less than 16 per cent butter fat.
One-fourth cream not less than 8 per cent butter fat.
Skimmed—less than 8 per cent butter fat.
- (20) Cheese—Half skim not less than 25 per cent butter fat.
Quarter skim not less than 12 per cent butter fat.

U. S. DEPARTMENT OF AGRICULTURAL STANDARDS

Milk and Its Products

1. *Milk* is the whole, fresh, clean, lacteal secretion obtained by the complete milking of one or more healthy cows, properly fed and kept, excluding that obtained within fifteen days before and five days after calving, or such longer period as may be necessary to render the milk practically colostrum-free.

2. *Blended Milk* is milk modified in its composition so as to have a definite and stated percentage of one or more of its constituents.

3. *Pasteurized Milk* is milk that has been subjected to a temperature not lower than 145 degrees Fahrenheit for not less than thirty minutes. Unless it is bottled hot, it is promptly cooled to 50 degrees Fahrenheit or lower.

4. *Sterilized Milk* is milk that has been heated at the temperature of boiling water or higher for a length of time sufficient to kill all organisms present.

5. *Homogenized Milk* is milk that has been mechanically treated in such a manner as to alter its physical properties with particular reference to the condition and appearance of the fat globules.

6. *Skimmed Milk* is milk from which substantially all of the milk fat has been removed.

7. *Buttermilk* is the product that remains when fat is removed from milk or cream, sweet or sour, in the process of churning. It contains not less than eight and five-tenths (8.5) per cent of milk solids not fat.

8. *Goat's Milk*, *Woe's Milk*, et cetera, are the fresh, clean, lacteal

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secretions, free from colostrum, obtained by the complete milking of healthy animals other than cows, properly fed and kept, and conform in name to the species of animal from which they are obtained.

9. *Condensed Milk, Evaporated Milk, Concentrated Milk*, is the product resulting from the evaporation of a considerable portion of the water from the whole, fresh, clean, lacteal secretion obtained by the complete milking of one or more healthy cows, properly fed and kept, excluding that obtained within fifteen days before and ten days after calving, and contains, all tolerances being allowed for, not less than twenty-five and five-tenths (25.5) per cent of total solids, and not less than seven and eight-tenths (7.8) per cent of milk fat.

10. *Sweetened Condensed Milk, Sweetened Evaporated Milk, Sweetened Concentrated Milk*, is the product resulting from the evaporation of a considerable portion of the water from the whole, fresh, clean, lacteal secretion obtained by the complete milking of one or more healthy cows, properly fed and kept, excluding that obtained within fifteen days before and ten days after calving, to which sugar (sucrose) has been added. It contains, all tolerances being allowed for, not less than twenty-eight (28) per cent of total milk solids, and not less than eight (8) per cent of milk fat.

11. *Condensed Skimmed Milk, Evaporated Skimmed Milk, Concentrated Skimmed Milk*, is the product resulting from the evaporation of a considerable portion of the water from skimmed milk, and contains, all tolerances being allowed for, not less than twenty (20) per cent of milk solids.

12. *Sweetened Condensed Skimmed Milk, Sweetened Evaporated Skimmed Milk, Sweetened Concentrated Skimmed Milk*, is the product resulting from the evaporation of a considerable portion of the water from skimmed milk to which sugar (sucrose) has been added. It contains, all tolerances being allowed for, not less than twenty-eight (28) per cent of milk solids.

13. *Dried Milk* is the product resulting from the removal of water from milk, and contains, all tolerances being allowed for, not less than twenty-six (26) per cent of milk fat, and not more than five (5) per cent of moisture.

14. *Dried Skimmed Milk* is the product resulting from the removal of water from skimmed milk, and contains, all tolerances being allowed for, not more than five (5) per cent of moisture.

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15. *Malted Milk* is the product made by combining whole milk with the liquid separated from a mash of ground barley malt and wheat flour, with or without the addition of sodium chlorid, sodium bicarbonate, and potassium bicarbonate, in such a manner as to secure the full enzymic action of the malt extract and by removing water. The resulting product contains not less than seven and one-half (7.5) per cent of butter fat, and not more than three and one-half (3.5) per cent of moisture.

CHAPTER X

How Shall Milk be Distributed

City consumers as a rule now get their daily supply of milk either by going to the retail store for it or by daily delivery to the door by the retail milk wagon. Through either of these channels the milk may be delivered, dipped, into containers brought by the consumer, or may be delivered in bottles filled at the milk plant. The retail wagon may be driven by the milk producer himself or it may be one of many belonging to a city distributor.

The retail store, whether it be a grocery or drug store or a branch store owned by the milk company, may carry milk chiefly as an accommodation to its patrons or it may act as the chief, if not the only, source for the family milk supply. Which of these services should the retail store furnish?

For the extra supply of milk needed by the housewife the retail stores furnish an essential service. The housewife may need an extra bottle for a dessert planned after the milkman has passed for the day. Or the iceman has forgotten to leave ice, and the milk is sour. For such occasions it is well to have a store within walking distance at which this unusual need may be met. If the retail stores furnish only the occasional need, their prices can be above those of the retail milk wagons and no adverse social consequences result therefrom.

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Should the retail store be the main source of supply for the family, leaving the retail wagon to furnish only those homes desiring to pay for delivery direct to the door? In other words, which is to have first place as a retail agency, the store or the milk wagon? The answer to this question requires answer to three questions:

- (1) Which of these two agencies is the cheaper in cost to the consumer?
- (2) What has been the experience with "cash and carry" plans?
- (3) Should milk be sold dipped or bottled?

The margin taken by the average grocery store for carrying bottled milk ranges from one to two cents per quart; about one-half taking a margin of two cents or above, and one-half a margin of from one to two cents. The margin taken by the store for selling dipped milk ranges from one-half to one cent per quart.

Professor H. E. Erdman, of Ohio State University, who has studied the costs in handling bottled milk in stores, found that the cost of ice per bottle for the summer months ranged from 0.087 to 0.417 of a cent with a weighted average of a quarter of a cent (0.221) per bottle. To this ice cost must be added labor costs, risks and overhead. Retail storekeepers in New York City told representatives of the Food Administration that their "costs" averaged about three-quarters of a cent per quart for dipped milk, exclusive of sours and other risks.

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The amount of losses from sour milk and "returns" vary with trade practices. If the milk dealer takes this risk the cost is transferred to his books. But the cost is ever present and material. So it is with bottles. "Cost" to the groceryman mounts if the dealer holds him responsible for bottles. Moreover, the demand varies from day to day and hence the store is confronted with losses from milk not sold, or the entire trade is not supplied. The milk dealer can afford proper facilities for taking care of milk not sold.

Milk in the small store cannot be inspected either for watering or as to sanitary conditions as effectively as can milk of the professional milk distributor. The latter has a larger trade and much more to lose from adverse publicity than has the former. Rarely, City Health Departments have wanted to keep the stores because they pay license fees to the Health Department.

The quantities handled by stores reflect the trade policy as to price. In Philadelphia only the exceptional retailer handles as much as 20 quart bottles and 20 pint bottles daily, and 3500 stores retail milk. Milk from the store in Philadelphia retails usually at a margin of two cents above the price for milk delivered from the retail wagon. In Columbus, Ohio, with one-tenth the population of Philadelphia, over 800 stores retail milk. These stores handled in 1918 on the average¹ 22.5 quart bottles and 26 pint bottles daily ~~as against~~ an average of less than

¹ From Professor Erdman.

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ten quarts and as many pints in the retail store in Philadelphia. In Columbus the price for milk at the store was the same as from the retail milk wagon.

"Costs" on units as small as milk bottles and in quantities so limited as just given are illusive at the best. The acid test is: *what will retail stores handle milk for?* Grocers inevitably refuse to handle bottled milk at a margin less than one cent per bottle and many abandon the service at a margin under two cents. Most grocers prefer not to handle milk at all unless it is advisable to do so because others do. Grocers in New York City have handled dipped milk at a margin of one-half a cent per quart for a few months, but desire, and frequently get, a margin of at least one cent with an average around three-fourths of a cent per quart.

Can, and does, the retail wagon perform these same services at a lower margin? The answer is definite. The saving in delivery of milk in quantities desired by grocery stores does not amount to as much as one-half a cent per quart. The author is aware of cost records showing that special wholesale route automobiles, delivering in large quantities only to stores in a congested retail district, perform their services at an apparent saving of one cent per quart over the cost of house-to-house delivery on the retail wagon. But this does not represent the cost of delivering milk wholesale to all retail stores—those in the suburbs as well as those in congested centers. When these costs are taken into consideration the average saving of delivery in quantities

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to retail stores does not amount to one-half cent per quart on all the deliveries as compared with the cost of delivering to the consumer.

Grocerymen prefer not to handle milk, if at all, at less than one cent per quart; milk dealers with cost records would prefer not to sell to grocery stores at so little discount as one-half cent per quart from their house-to-house price. The retail wagon performs the same service at less cost than can the retail store. And this regardless of the fact that the consumer herself does the delivery work for the retail store.

One of the reasons for this lies in the loss in bottles. At the present price for bottles, the bottle cost on store trade alone averages over one-fourth of a cent per trip, twenty trips for a five-cent bottle. It is not difficult to get consumers in the habit of setting bottles out regularly at the back door for the regular morning delivery. But the milk industry, thus far, certainly has not learned the art of getting customers to return bottles to the retail store. The higher rate of loss on bottles alone in grocery store trade more than eats up any economy in delivering limited quantities to one grocery store as compared with house-to-house delivery. The same territory is traversed anyway, and a milk route horse is soon taught to do much of the delivery work.

To promote social and individual well-being there must be regularity in milk consumption. But people will not go to the stores regularly for their milk. The maid is out or the children are late for

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school, or the mother has company, or nothing else is needed from the store. Retail delivery to the door not only keeps the milk on the retail wagon that would otherwise go through the store but it increases milk consumption because of regularity in consumption, thus adding to the retail load, shortening the haul and lowering unit delivery costs.

In November of 1917, H. P. Hood & Sons of Boston, in consultation with the Local Food Administrator, opened a number of special "cash and carry" stores throughout Boston, to the end that those consumers who wanted to carry their milk could benefit from any savings therefrom. This plan was tried for a period of about six weeks. Milk before this experiment was selling from the retail wagon at 14 cents per quart. Soon the stores were selling the milk at cost, as a "leader", at 11 cents per quart. The retail wagons largely lost their trade. There was no evidence of increased consumption because of the lower price.

Assistant Attorney General Seagrave of Massachusetts thus summarized the results of the experiment:

I have been requested to communicate my views to you relative to the effect of the so-called "cash and carry" system as applied to the milk business in Boston, which has recently been given a test for some six weeks.

Certain milk depots were opened where milk was sold under the ticket system of ten quarts for a dollar, or 11 cents cash. The system was instituted by one of the large dealers with the

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approval of the Food Administrator. The immediate result was the fixing of similar rates in every milk depot and store in Greater Boston. At first the sales were reasonably large, but in a few days the novelty wore off and sales commenced to drop. In the meantime, nearly every milk route was disorganized, at a great loss to the dealers, all of whom lost money, and some of the smaller dealers were practically forced out of business or else so badly involved that such will be the ultimate result. In my opinion the introduction of this system was a great mistake and has demoralized conditions in the milk business ever since. As another result of the ruinous competition, the price to the farmers was dropped one-half cent a quart. It is my opinion that there is no real economy in selling milk in this manner. Even if every consumer carried his own supply from the stores, the additional clerks, the keeping of all stores open on Sundays, the cost of refrigeration and icing in summer, and other incidental expenses would bring the cost up as high as that of the delivery system, even though nothing were allowed for the trouble and inconvenience which the system must bring about. In order to attract the trade the price must be abnormally low.

The result of the experiment here has been, in my opinion, disastrous.

During the war period the author sent a special investigator¹ to cities where the Food Administrator was trying out "cash and carry" plans of any kind for milk, with instructions to ascertain: (1) Whether these plans brought milk to the consumer at a lower

¹ Mr. K. E. Carlson.

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price; (2) whether the consumer went regularly for the milk; (3) whether per capita milk consumption was higher or lower under such plans; (4) whether workers in charitable organizations and others concerned in keeping milk to the consumer at as low a price as possible favored such "cash and carry" plans; and (5) what the attitude of health departments was as to dipped milk if the "cash and carry" plans included dipped milk. Among the cities visited to secure this information were Boston and Springfield, Massachusetts; Pittsburgh, Philadelphia and Wilkes-Barre, Pennsylvania, and New York City. As a rule the following conclusions were reached on each of the above points respectively: (1) These plans tended to increase the cost to all consumers by decreasing the load on the retail wagons, though the price paid by those who carried their milk was about one cent per quart lower than that for milk delivered to the door; (2) consumers did not go regularly for their milk and as a rule returned to the retail wagon for their regular daily supply as soon as the novelty of the "cash and carry" plan had worn off; (3) the per capita consumption of milk in families using the "cash and carry" plan was lower than in the same families when milk was delivered regularly to their doors; (4) the most of the workers interviewed in charitable organizations were not impressed with "cash and carry" plans, since those most in need of a regular supply of wholesome milk in good condition—mothers and the sick—so often could not avail

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themselves of this source; and (5) with but one exception the health officials interviewed opposed dipped milk on sanitary grounds.

Not so many years ago most milk was delivered as dipped milk, whether from the retail wagon or from the grocery store. Today New York City is the only city in the United States of any size in which public policies favor the sale of dipped milk from retail stores. In the other cities either public policies as to sanitation or the preference of the consumers for the bottled milk delivered at the door in a refrigerated condition, or both, have discouraged the distribution of milk from the retail store in containers brought by the consumer, and have encouraged milk distribution in bottles by retail wagons direct to the consumer. For these reasons the sale of dipped milk from the retail wagon has practically ceased to exist.

The advantages urged for the policy of selling dipped milk at the grocery store are:

- (1) The cost of the bottle is eliminated.
- (2) The cost of wholesale delivery by the milk dealer in cans, in the quantities taken by the grocery stores, is lower than is the cost of distributing quart and pint bottles to the consumer by retail milk wagons.

- (3) Because of these lower costs this method offers the cheapest method of milk distribution.

The disadvantages of dipped milk are:

- (1) The inspection force adequate to assure the sanitary handling of bulk milk by the grocery store

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would have to be so large as to underwrite through taxation much of the economies possible through elimination of the bottles.

(2) The milk is carried home in containers improperly sterilized, exposed to the dust of the street and the home. As the city dust of today is made of the spittings of yesterday this can scarcely be regarded as adequate protection from dust-borne diseases.

(3) The consumption of milk is not as large per capita because irregular for reasons stated above.

To take forty-five quarts (three stores at fifteen quarts each) off the retail wagon is to cut the profit on the retail trade. To put part of the milk through grocery stores and part through the retail wagon is a costly duplication for which the consumer pays.

But even assuming that stores can be inspected often enough to assure sanitary conditions, there is still the objection of cost. There are no adequate records as to just how much of the milk consumed in New York City is sold as dipped milk. But we do know that about 65 per cent of all the milk distributed in New York City is sold as bulk milk in cans, a considerable portion of which is retailed as dipped milk by stores. But 35 per cent of all the milk consumed in New York City is delivered in bottles. Distributing costs from the retail wagon in New York City reflect the higher cost due to duplication of service.

The retail wagons in New York City average about 250 quarts per wagon as compared with 400

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or more in Philadelphia and 450 in Pittsburgh. In Philadelphia, where 90 per cent of the milk is on the retail wagon, the milk dealer delivers milk bottled and cooled to the consumer at about the same spread that the consumer in New York City pays for dipped milk at the store. If New York dealers had 90 per cent of the milk sold to consumers on the retail wagon their costs per bottle delivered would be materially less than it is and all consumers could get their milk delivered at a lower price than it now costs them.

The Mayor's Committee in New York City, which reported in the Autumn of 1917, stated that if the load on the retail wagon in New York City averaged 428 quarts (about the present average in Philadelphia) the bottled milk then being sold in New York City (estimated at 704,318 quarts) could all be delivered on "2243 retail wagons instead of the 4978 actually in use at the present time. This would mean only 45.3 per cent of the present number, or a saving of 54.7 per cent of the total." But a driver could not handle 428 quarts on the average unless he had a relatively short haul. With a larger portion of the milk bottled, more could go on the retail wagon and the haul could be shorter. Hence, the cost of distribution of bottled milk per quart could be lowered.

A quart milk bottle now costs a little over five cents. It should make at least thirty trips in the wagon trade. This is a cost for the container of about one-sixth of a cent per quart per trip. Is it

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worth this to the consumer to have the milk delivered daily and regularly at the door in good condition? In addition to the cost of the bottle is the fraction of a cent due to cleansing and sterilizing milk bottles, putting stoppers into them and for refrigeration on the retail wagon. Is this cost worth daily delivery to the door? These same costs accrue to the consumer through the retail stores. Since the grocer's costs and profits are more than the savings to the milk dealer in quantity deliveries, sales of bottled milk through the grocery stores are more costly to consumers than sales through the retail wagon.

The author was called into a Pennsylvania city to advise as to the price of milk. The dealers were insisting that the price to the consumer would have to go to fifteen cents per quart for the following month, with the price paid to the farmers remaining the same. The reasons given by the dealers were that their bottle, plant, wagon, feed and labor costs were going up and that they had to have another cent per quart from the consumer to meet these rising costs.

Milk was then retailing to the consumer at 14 cents per quart, bottled and pasteurized. Of the bottled milk sold in the city, 60 per cent went to the grocery stores at 12 cents per quart. This milk the grocery stores sold to the consumer at 14 cents per quart. From the retail wagons 40 per cent of the city's consumption was delivered to the door at 14 cents per quart. But one milk dealer in the city had cost records. From these records and from

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cost records of dealers in other cities the author proved to the milk dealers that they were actually losing more money on the 60 per cent of the milk delivered to grocery stores at 12 cents per quart, in view of the price to the farmer, than they were making on the 40 per cent of the milk they sold to consumers from retail wagons at 14 cents per quart. He therefore suggested that, instead of raising the price to the grocery store to 13 cents and to the consumer, by grocery store and retail wagon, to 15 cents, they lower the price to the consumer to 13 cents for milk delivered from the retail wagon and charge the grocery stores the same as they charged the consumer. The grocery store would then retail milk as an accommodation at 15 cents per quart, but the greater percentage of consumers would buy their milk delivered at their door at 13 cents per quart.

This policy was adopted. The results were: (1) consumers got their milk at one cent per quart lower than they did when more than half of the milk was distributed through the grocery store and less than half through the retail wagon; (2) the retail wagons were soon carrying 85 per cent of the bottled milk in the city at lower costs per quart because of larger loads and shorter hauls; (3) the milk dealers made a reasonable profit with milk at 13 cents to both consumers and grocery stores, when they were losing money at 14 cents to consumers and 12 cents to grocery stores. Similar results have been secured in other cities under similar conditions.

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Milk is most economically distributed through one channel and that channel is the retail wagon.

Proposals as to methods of milk distribution that will revolutionize existing methods must be passed in review only. One is to have a "nickel-in-the-slot machine" in each apartment house or drug store for self service. Because of refrigeration and other difficulties this method has, to date at least, been found impractical. Another proposal is to deliver milk in paper containers sterilized and sealed at the plant, to be opened by the consumer as used. Thus far the cost of this has been prohibitive. Then there is the delightfully sophomoric plan that the public schools be made the center for milk distribution, whether by the school teachers (since they have so little to do now) or by society ladies (who of course have nothing else to do) or by paid officials, doth not appear. A proposal that would change the whole industry (and it is not without merit, even though impractical under present standards and costs) is to have the water extracted from the milk in the country and sell to consumers milk remade in the city by homogenizing skim milk solids, sweet butter and water. This remade milk is discussed elsewhere. All of these plans must await far-reaching changes if they are ever to be both commercially successful and acceptable to the public. And none of them can change the essential question discussed in this chapter.

The argument in favor of retail store distribution as a policy is that certain consumers cannot afford

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refrigerators and therefore must use (and pay for) the refrigerator in the grocery or drug store. The answer to this argument is that for most of the year, in most of the United States, milk can be kept from the morning delivery until supper without ice. In the warm months milk can be kept certainly for two meals without ice. That means that the consumer without a refrigerator must go to the grocery store for the milk necessary for children, for one meal for the hot season only. Under these conditions it is cheaper even for the consumer to have the milk delivered at the door regularly and use the grocery store for the special days and for special needs. The percentage of consumers without refrigerators varies as between sections of the city and as between races. But the proportion of households with refrigerators is rapidly increasing. Moreover, a canvass of wage-earning sections, from which one would expect demands for a lower price of milk at the grocery store because of a lack of refrigerators in the homes, revealed that most wage-earners have refrigerators and want their milk delivered regularly at the door. For the mother in such homes has plenty to do without being her own delivery boy.

The best policy for milk distribution is to have the milk delivered, bottled and refrigerated, at the consumer's door. This means that the price to the grocery or drug store should be the same as to the consumer from the retail wagon, the grocer and the druggist retailing milk as an accommodation at one

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or two cents per quart above the price the consumer pays for milk delivered at the door, because,

(1) The larger the retail load and the shorter the haul, the lower the cost of delivery per quart from the retail wagon.

(2) By concentrating the handling and distributing of milk with those especially equipped to handle it the costs per quart can be lowered and the wholesomeness of the milk more certainly guaranteed.

(3) The cost saved by delivery in quantities to the grocery store is not as large as the grocer's cost of keeping and selling milk. In addition to this there is a larger loss of bottles from the store trade. Retail delivery to the consumer is therefore the more economical method of the two.

(4) Milk is a perishable commodity and should be maintained and delivered under wholesome refrigerated conditions.

(5) Dipped milk is more exposed to contamination than bottled milk and the savings are small as compared with the better quality and service from the retail wagon.

(6) Milk cows and hungry children alike recognize no holidays and no Sundays; stores do. The advantage of the store as a neighborhood refrigerator has also its limitation: it cannot always be open.

The best and cheapest channel for milk distribution is the retail milk wagon, leaving to the retail store such sales as may prove worth while as an accommodation.

CHAPTER XI

Can Milk Distribution Costs Be Lowered

It is pointed out on page 182 that the portion of the consumers' price taken for a few months after the armistice by the milk dealers in Philadelphia for their costs and profits was around 25 per cent more than the portion needed for these purposes, on the average, for the fifteen years preceding the war. It is there pointed out also that the portion of the cost to the consumer, taken by the milk dealers serving the consumers of New York City for costs and profits increased 36.3 per cent from 1915 to 1918.

In Philadelphia, before the war, when milk was selling at eight cents per quart, about four cents of the annual average price per quart went to the producer, f. o. b. Philadelphia, and four cents to the distributor. This was the situation in 1914. By 1919 the farmer was receiving nine cents per quart, f. o. b. city, and the distributor five cents per quart for his services. The price to the producer, that is, had increased 125 per cent while the share taken by the distributor had increased 25 per cent. In other words, out of a six cent increase in the price of milk to the consumer in Philadelphia during the war period, five cents went to the farmer and one cent to the milk distributor.

Throughout the war period and since Philadelphia consumers have purchased milk at from one to two

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cents per quart below the price prevailing in any other eastern city and at a price as low as in any city in the United States, including those in the corn and wheat belt where the price to the milk producer has been below that in the Philadelphia territory. This low price to consumers was not at the expense of milk producers. For the producers of milk in this territory received during this period as high a net annual price as did the milk producers in any primary market in the country. To account for

ANNUAL SPREAD TO MILK DISTRIBUTOR IN CLEVELAND, 1914-1919

	1914.	1915.	1916.	1917.	1918.	1919.
Price per quart paid producer, f. o. b. receiving station, 3.5 per cent milk	\$0.030813	\$0.030369	\$0.034354	\$0.049237	\$0.066583	\$0.0676
Price received from consumer on quarts . . . . .	.08	.08	.0825	.1083	.13*	.14666
Spread retained by distributor from country to consumer . . . . .	.049187	.049631	.048146	.059063	.0634167*	.07906
Price per quart paid to producer, f. o. b. Cleveland . . . . .	.0381	.0380	.04166	.0573	.0775†
Spread retained by distributor from f. o. b. city to consumer . . . . .	.0419	.0420	.04084	.0510	.0525†

the favorable retail price in Philadelphia one must turn to the efficiency in plant and delivery of the Philadelphia milk dealers.

The Table above gives the margin or spread for expenses and profits in Cleveland, Ohio, for the years

* These figures include only the first three months of 1918.

† Not available for 1919.

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1914 to 1919, inclusive, when measured (1) by the difference between the net price paid to producer f.o.b. country receiving station and the price paid by consumer, and (2) by the difference between the price paid the producer f. o. b. Cleveland and the price paid by consumer.

The average spread in 1918 showed an increase over that for 1914 of about 30 and 40 per cent respectively from the country receiving station and from f. o. b. city to consumer. The increase in spread for 1919 from country to consumer was 56 per cent over that of 1914.

The portion taken per quart in the city of Columbus for distribution from f.o.b. city to consumer increased 60 per cent from 1914 to 1919.

AVERAGE ANNUAL SPREAD TO MILK DISTRIBUTOR IN THE
CITY OF COLUMBUS, OHIO, 1914-1919

	1914.	1915.	1916.	1917.	1918.	1919.
Price per cwt. to producers for 4 per cent milk, f. o. b. Columbus.....	\$1.88	\$1.82	\$1.90	\$2.52	\$3.42	\$3.81
Price received from consumer on quarts.....	.08	.08	.08	.0883	.13	.1425
Spread retained by distributors on quarts retailed.....	.0325	.0375	.0375	.04	.0458	.0523

The chart on the next page compares (1) the relative increase in the prices for all commodities in the United States with (2) the increase in price to the producer, (3) the increase in the spread to the milk distributor, and (4) the increase in price to the

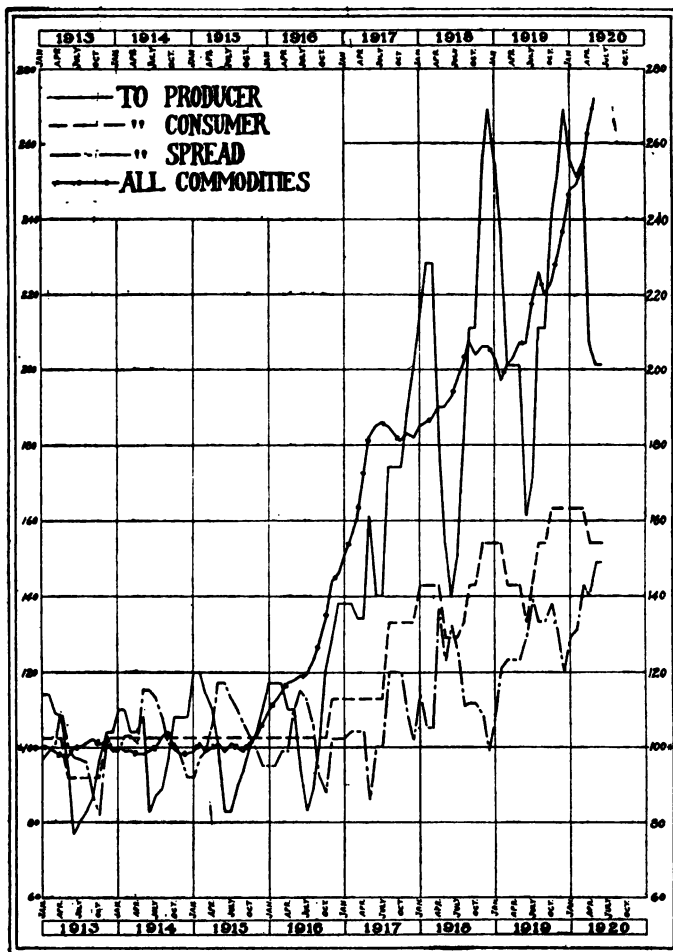


CHART NO. XVIII.—THE RELATIVE INCREASE IN THE PRICE OF ALL COMMODITIES IN THE UNITED STATES AND THE INCREASE IN THE PRICE OF MILK TO PRODUCERS AND TO CONSUMERS AND THE SPREAD TO DEALERS IN THE PITTSBURGH DISTRICT, JANUARY, 1913, TO JUNE, 1920. JULY, 1913, TO JUNE, 1914 = 100.

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consumer from 1913 to June, 1920, inclusive, in the Pittsburgh district.

From July, 1913, to June, 1914, the price of milk to the consumer in Pittsburgh averaged $9\frac{3}{4}$ cents per quart. Of this amount $4\frac{3}{4}$ cents went for distributing costs from f. o. b. city to consumer, and $5\frac{1}{4}$ cents went to the farmer and for freight and country receiving station charges. In 1919 the consumer paid an average of 14.7 cents per quart. Of this amount 5.97 cents per quart went for distributing costs and 8.73 cents per quart to the cost of milk in the country and the cost of country receiving stations and for freight. The distributing costs within the city during this period increased, that is, about 25 per cent, as compared with an increase of $47\frac{1}{2}$ per cent in the total for milk, freight and receiving station charges. From July, 1913, to June, 1914, the producer at the country receiving station received a monthly average of \$1.49 per hundred weight for his milk. During the calendar year 1919 the producer received an average of \$3.26 per hundred weight, an increase of 119 per cent, as compared with an increase of 114 per cent in the general price level. During this period the price to the consumer per quart increased 50 per cent as compared with 114 per cent for all other commodities. It is thus seen that the favorable price to milk consumers in Pittsburgh has come through lower relative charges by distributors both in the country and in the city.

In authorized statements shoe manufacturers have held that their costs, including materials, went up

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from \$3.35 in 1914 to \$10.04 in 1919. Had the milk dealers in Pittsburgh increased the charge for their services in this same proportion, milk would have sold at 24 cents per quart when it was selling at 16 cents, keeping the same price to the producer. Had the price to the milk producer and distributor both gone up in the same ratio as shoes the price of milk would have been 28 cents per quart. Had the price of milk to the consumer increased in the ratio of clothing prices from 1913 to 1919 the price would have been 34 cents per quart instead of 16 cents.

Now wage costs to these milk dealers increased as rapidly as did wages in other businesses. The cost of glass bottles, milk machinery and other materials went up to these milk dealers in the same proportion that materials advanced in other businesses. The prices on the 1437 commodities represented in the "all commodity" curve in the chart above increased 114 per cent from 1914 to 1919. Yet the spread taken by the dealers for costs and profits has advanced in many cities, if not in most large American cities, from but 25 to 60 per cent; and more are nearer the former figure than the latter.

Why is this possible? Only because of the savings due to the tendency to do away with duplication in retail milk deliveries, and because of the economies that have come to the dealer through larger quantities of milk handled at the country receiving station, at the city plant and on the delivery wagons. So far as low unit costs are concerned, the ideal is one milk wagon on each street, carrying the advisable grades

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of both raw and pasteurized milk, handled through plants of sufficient size, in relation to the city, to give minimum unit costs in cooling, pasteurizing, bottling and refrigerating. This ideal has led many a public milk commission to recommend zoning of retail milk wagons under public supervision.

What are the economies in large scale handling of milk and in doing away with duplication of service on the streets?

The cost per quart for pasteurizing milk, including the investment for plant and operating costs, decreases with increase in the size of the plant and in the amount of milk handled; there is also a decrease per unit in the cost of bottling milk, including a lower price for caps bought in larger quantities, and in the process of bottling itself; there are economies in route service certainly up to the point where the route is as heavy as one vehicle can serve in a reasonable drive; there are economies in motor truck distribution from the freight stations to the plant; in the return of milk cans from the plant to the station; and in large scale buying and sterilizing of milk bottles. The cost of handling milk at the receiving stations decreases per quart with the quantity of business. Large scale distribution by a single company would eliminate duplicate competitive advertising. Laboratory work can be carried on more effectively and at less relative cost per unit without useless duplication. There are also savings in overhead charges, because there are in most cities already at least twice the investment in plants and

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wagons necessary to handle well all the milk delivered in the city.

Mr. John R. Williams, in 1911, made a study of the money cost of the duplication in milk distribution in the City of Rochester, N. Y.¹

In one section of the city he found that the 27 distributors therein traveled more than 20 miles to furnish 273 homes, whereas one dealer could render the same service by traveling not more than 2.6 miles. He secured data from 173 milk distributors, practically all of the milk distributors in the city. The equipment and man power used under the then existing system of milk distribution were compared with the equipment and man power essential under a system of non-duplication as follows:

<i>Under Present System</i>	<i>Under Model System</i>
356 men, and in many cases their families.	90 men. }
380 horses.	50 horses.
305 wagons.	25 horse-drawn trucks.
2509 plus miles travel.	300 miles travel.
\$76,600 invested in milk-room equipment.	\$75,000 equipment for sanitary plant.
\$108,000 invested in horses and wagons.	\$30,750 equipment of horses and trucks.
\$2000 present daily cost of distribution.	\$600 estimated daily cost of distribution.
\$720,000 yearly cost of distribution.	\$220,000 estimated yearly cost of distribution.

¹ Printed in the Transactions of the Fifteenth International Congress on Hygiene and Demography held at Washington, D. C., September 23-28, 1912.

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Dr. William's conclusions were:

In the foregoing estimates, liberal provision is made for amortization, interest and superintendence. Mention is not made of all the wastes that could be obviated under efficient management, and it is believed that conclusions here presented represent most conservative judgment. There is little question that if the milk supply of Rochester were to be distributed by one agency, properly organized and equipped, a saving to consumers of at least \$500,000 yearly could be effected.

The Milk Committee appointed by the Food Controller for Canada to investigate milk supplies for urban municipalities concluded that unnecessary duplication in milk distribution resulted in excess costs over a single zone delivery system of one-fourth of a cent per quart in plant costs, three-fourths of a cent per quart in delivery costs, and one-fourth of a cent per quart on bottle losses. This means that the savings in a single delivery system would total one and a quarter cents per quart.

The Dominion Department of Agriculture estimates that the per capita daily consumption of milk to be one-half pint per day. The saving of one cent per quart on milk distribution in Canadian cities would amount to \$1,500,000 annually. On the committee responsible for this estimate was John Bingham, the leading milk distributor of Ottawa, Canada, and widely known as an efficient business man.

The author, with the coöperation of one of the vigorous and effective county Food Administrators

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of Pennsylvania, tried out the economies in zoning one of the smaller cities of Pennsylvania. With the routes zoned so that there was but one retail milk wagon on each street in the city, the dealers made more money on a spread of four cents per quart than they had made previously on a spread of five cents. This saved the consumer one cent per quart.

In some cities the direct savings by zoning milk routes would not amount to as much as one cent per quart at first, but in any city savings would amount to at least one-half a cent per quart. The amount of the savings would depend upon such factors as: the extent of duplication in plant equipment and on the street; the load on the retail wagons; the character of the city's streets; the density of the residence districts; the topography of the city; the managerial ability employed.

Many of the economies in zoning of milk routes to prevent duplication will appear after the zoning has been accomplished. For instance, the loss on bottles due to carelessness of consumers can be prevented. The gratuities now given to keep a competitor out of a given apartment house or residence section will be avoided. Capital will be attracted at lower interest levels, because undue risks will be done away with.

The Mayor's Milk Committee of the City of New York, reported (1917) that the number of retail and wholesale wagons used to handle the milk supply of New York City was:

Bottled milk supply.	704,318 quarts
Milk in cans.	896,405 quarts

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Retail wagons.	4,978
Wholesale wagons.	1,522
Average load of retail wagons.	142 quarts
Average load of wholesale wagons.	14.7 cans

As to the economies incident to the elimination of competition and the substitution of single-service delivery, this committee quotes with approval the following conclusions of the Wicks Committee appointed by the Governor of the State of New York:

This business (milk) is conducted on an extremely competitive basis; . . . a large part of the cost arises from the bitter competition existing in the distribution of the product. . . . An army of solicitors and sales agents are maintained. . . . Great and expensive organizations are maintained. . . . Overhead charges attributable to this work amount to an alarming sum. . . . It is customary to refer to the fact that four or six or ten milk wagons and milk drivers visit the same block, . . . but this ignores the really greater expense of the silent army of retainers. . . . Not only do we find in single blocks these wagons and horses, but on the same block six solicitors, six route superintendents, six staffs of clerks and bookkeepers. . . . The distribution of milk is a public service, which, to be put upon an economic basis, requires public regulation to the end that all unnecessary services even of a competitive kind may be eliminated.

Distribution of Milk Should be a Regulated Public Service

It is safe to assert that the consumer in the City of New York pays several millions of dollars annually for the privilege of having all the numerous

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purveyors of this necessity of life engage in attempts to serve him. . . .

It certainly seems as if the dairymen of this State, and the distributors with their invested capital, and the consumer, should coöperate to the end that these unnecessary competitive wastes be eliminated. . . .

The investigations of the committee lead to the conclusion that under the present competitive system it takes almost as many men to bring the dairymen's milk to the consumer as there are dairymen engaged in the production of milk with all their employees. This is the result of the purely competitive basis upon which the business is handled. Three or four milk stations are being maintained with a separate force of employees to collect and receive the dairymen's milk at many points where one well-equipped station with a competent force could do all the collecting at one-fifth the present expenses. This unnecessary duplication of service follows with all its attendant overhead and capital investment from the country milk station until the bottle of milk is finally deposited at the consumer's door. A large part of this, in the judgment of this committee, could and should be eliminated. . . . The only solution possible is to limit and leave only those in the field which the service actually requires. This is just as obvious in the case of milk as it is in gas or any other daily necessity supplied in small quantity to the consumer.

A milk dealer in a large eastern city handled, in 1917, 1,458,320 pounds of milk in the month of lowest production and 2,605,931 pounds in the month of highest production, with 27 employees for

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the month of lowest production and 28 employees for the months of highest production. In other words, nearly twice as many pounds of milk were handled at maximum production with the addition of but one employee. The next year, with the same number of employees, a minimum of 1,747,939 pounds were handled during the month of lowest production and 2,823,219 pounds during the month of highest production. That is, with the same number of employees, a much larger amount of milk was handled in 1918 than in 1917, and hence the cost of handling per quart was lower.

From the cost records of a large milk dealer in the Mississippi Valley, the author secured the following facts as indicative of the lower costs per quart when volume increased. For the six months ending February 28, 1918, the sales in dollars amounted to \$642,662.08. Of this amount \$480,214.50, or 74 per cent, was paid for the milk f. o. b. city. The selling, delivery, general and administrative expenses in the city totaled \$153,151.14, or 24 per cent of sales. For the six months ending August 31, 1918, the sales totaled \$776,040.99, an increase of 21 per cent. The cost to distribute this milk within the city (selling, delivery, general and administrative expenses) was \$173,689.87, or 22 per cent of the total received for sales. That is, the cost of distribution increased but 12 per cent to care for an increase of 21 per cent in sales. And the costs of labor and materials were higher in the latter six month period than in the former!

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Into a certain city in the East the author was called by a local food administrator because the large milk dealers of the city were demanding a substantial increase in spread to offset what they claimed was a "40 per cent increase in cost because materials had gone up 50 per cent and labor 30 per cent." An examination showed these percentages as to materials and labor to be substantially correct. But it was also found that the larger retail loads and better utilization of plant equipment due to a war population and to a decrease in the number of milk dealers in the city, had more than offset the increases in material and labor costs so that, on the same spread, the milk dealers were making a higher profit than in the year preceding, despite the fact that "materials had gone up 50 per cent and labor 30 per cent."

It must be remembered that, as the load on the retail wagons goes up, and the number of milk drivers goes down in proportion to the amount handled, the number of clerical assistants needed may have to go up because the clerks have not increased relatively their output. For instance, one milk dealer in November, 1917, handled an average of 265 quarts on 93 retail routes, or 24,645 quarts daily, with 60 employees in the plant, with 15 clerks in the office and with 15 foremen for the 93 milk drivers. This dealer later increased the quarts on the retail wagon and decreased the number of drivers. By July of 1918 he was delivering 347 quarts on the average from 89 routes, or 30,883 quarts daily, with 70 employees in the plant, 14 foremen, and with 16

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clerks in the office. There were economies in plant and retail equipment. An increase of 20 per cent in volume was handled by an increase of 16 per cent in plant employees and 7 per cent in the number of clerks and a decrease of one foreman and four milk drivers.

Mr. Asa B. Gardiner, a milk distributor of Baltimore, Md., writes the author that a cost survey in November of 1919 of typical plants in four cities brought out this striking comparison on the basis of the quartage on the retail wagons:

City.	Average Number of Quarts on Retail Wagons.	City Distribution Costs per Quart (cents).
Ottawa, Can.,.....	550	3½
Philadelphia, Pa.	410	4½
Baltimore, Md.	335	5½
New York City.....	240	7¾

"Obviously," concludes Mr. Gardiner, "the quartage on retail wagons is not the only factor causing this price variation, but it is a substantial factor." The two principal reasons causing the low retail loads in New York City (dipped milk at the stores and limitations in load by drivers) are discussed in Chapter X.

Mr. Gardiner continues:

Route salesmen, will, when properly encouraged, taught and trained to effective salesmanship, average willingly this high quartage. The labor unions in New York City restrict and limit the

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sales per route and in other ways prevent their own members and the community from enjoying the results of higher route quartage.

The increased ratio of earning per quart or gallon of milk is the factor sought. Increasing volume of business by adding retail wagons without increasing quartage on present retail wagons offers no immediate benefit, the reason being that it requires a certain number of quart sales to pay its operating expenses. All additional quarts sold can be considered net profit, less salesmen's commissions and a slight allowance for use of bottles, caps, steam, etc.

To illustrate:

Average quarts per route.....	400
Sales to pay operating costs.....	320
Sales to pay profits.....	80

Again:

<i>Dairy A</i> 25 routes average.....	300 quarts
Grows by increased quartage to.....	350 quarts

If in each instance 320 quart sales were needed to meet expenses then at 330 quarts, only 10 quart sales realized a very small profit per wagon, which profit was, however, tripled when 350 quart sales were reached.

Dairy B with 25 routes averaging 330 quarts increases 500 quarts by putting on two route wagons with 250 quarts per day each. This reduced the route average to 324 quarts, so that only 4 quarts show for profit and there has been made a capital investment of the value of the two horses, harness and wagons. This dairy is not now as well off as before.

Any thinking man will realize that no routes should be added until the dead line of costs of

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quarts per route was first ascertained and then new routes started only when they promised soon to pass this dead line of costs.

Milk drivers profit in wages by increasing their retail loads when paid in whole or in part on a commission basis. This wage basis milk dealers are now using as a rule. Assuming that the total weekly sales on four retail milk routes are \$300, \$350, \$400 and \$450 respectively, we could get the following combinations for determining the weekly wage to drivers:

Wage Basis.	Weekly rate to Drivers when Net Sales on Retail Wagons are			
	\$300.00	\$350.00	\$400.00	\$450.00
Commission only at 11 per cent.....	\$33.00	\$38.50	\$44.00	\$49.50
\$15.00 weekly, plus 7 per cent on sales....	36.00	39.50	43.00	46.50
\$15.00 weekly, plus 6 per cent on sales....	33.00	36.00	39.00	42.00
\$20.00 weekly, plus 5 per cent on sales....	35.00	37.50	40.00	42.50
\$25.00 weekly, plus 4 per cent on sales....	37.00	39.00	41.00	43.00

Which of these wage plans a driver would prefer will depend on the load on his wagon and the average time required to retail that load. There is greatest motive to work when the wage is based on commission only, but the driver working on this basis may not, if handling packages selling at different prices, push the lower priced products in a way satisfactory to consumers or to the company. For instance, if whole milk is retailing at 14 cents per quart and skim milk at 8 cents, the driver working solely on a straight commission may soon get "out"

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of skimmed milk. If all packages sold at the same price a uniform commission would get uniform results. Where the wage is partly a fixed sum and partly a commission the proprietor can maintain route and sales policies that he cannot maintain when the wage is on a straight commission. Different policies will suit different sections and different dealers. These alternative wage schedules are cited here as methods of measuring pay by effort and ability, such as can be applied in other wage costs.

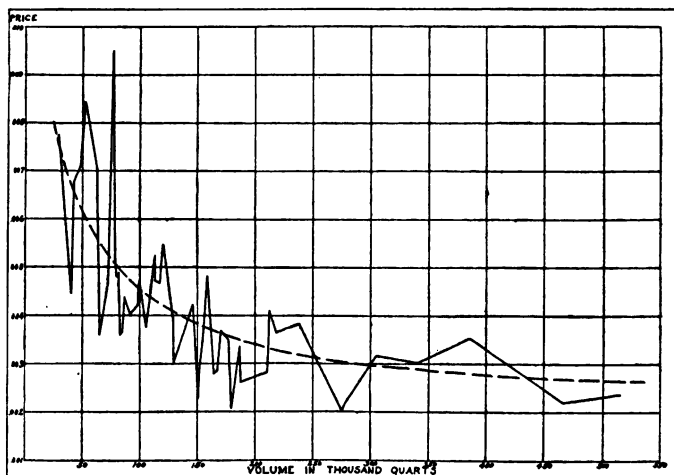


CHART NO. XIX.—DECLINING UNIT COSTS WITH INCREASING VOLUME IN THE RECEIVING STATIONS OF A LARGE MILK COMPANY

The chart above depicts the decrease in the unit costs of handling milk in the country receiving stations of one company. The unit costs and the vol-

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ume are for the month of August, 1919. Minimum unit costs are not approached until the volume reaches about 250,000 quarts. Other factors affect costs as well as volume. Those stations above the dotted curve have other costs such as those inherent in poor management that offset in part the economies in volume. The general tendency, however, is pronounced; *the larger the volume the lower the unit cost.*

The same results are revealed in the following table giving the ratio of unit costs and volumes in the country receiving stations of a Philadelphia milk dealer. The average volume and the average unit costs in all stations are taken as equal to 100.

DECLINING UNIT COSTS WITH INCREASING VOLUME IN TWENTY-ONE RECEIVING STATIONS IN THE PHILADELPHIA DISTRICT

	Station Number.										
	1	2	3	4	5	6	7	8	9	10	11
Relative amount of milk handled....	33	41	43	44	45	45	48	55	57	64	64
Relative cost per quart.....	178	137	140	89	80	122	102	116	79	76	100

	Station Number.										
	12	13	14	15	16	17	18	19	20	21	
Relative amount of milk handled.....	66	68	69	77	81	110	126	185	244	472	
Relative cost per quart.....	100	74	64	88	80	66	68	67	98	73	

The cost of handling milk in the receiving station with 472 per cent of the amount handled as an average in each of the receiving stations was but

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73 per cent of the average unit cost in all stations, whereas the unit cost in the station handling but 33 per cent of the average quantity handled by these stations was 178 per cent of the average unit costs in all stations. Here and there are stations whose unit costs are not absolutely in line with this rule, but an examination of the cost records revealed other cost factors at such stations to be abnormally large.

The rule is clear and important: *Volume pays in the country as well as in the city.*

Here is a company handling milk at its country receiving stations in May (1919), when volume is largest, at \$0.037 per quart as against \$0.0045 per quart in September, when the volume is not so large. For the same months the costs of two other companies are \$0.0033 and \$0.0049 per quart in May as compared with \$0.0043 and \$0.0061 respectively in September. The plant with the larger volume has substantial economies over the small volume plant.

The variations found in unit costs between different dealers for the same item reflects the possible savings in sound management. One dealer bottles and caps 45,000 quarts of milk per day with a direct labor cost of \$0.0005 cents per quart, using 6 employees for 56½ man-hours, a remarkably low cost. Another dealer for the same period for exactly the same service has a direct labor cost for 9000 quarts per day of \$0.0009, using 6 employees for 24 man-hours. This same service for the same period cost a third dealer handling 65,000 quarts per day \$0.0012

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cents per quart, requiring 20.3 employees for 192 man-hours.

The very nature of the product handled suggests the need for exceptional abilities to get lowest possible operating costs. As between plants there are substantial cost differences in such items as the amount of milk spilled in handling; left when emptying can because the can is not held upright long enough; leakage in bottling or in pasteurizing; breakage of bottles in plant; leaks in the coal bill because the heat is not utilized most efficiently; leaks in the stable because the horses are not fed a balanced ration; lost time because platforms are not placed well and the retail wagon not just suited to the needs; losses in poor collections; inadequate schooling of the route salesman (to the consumer only a milk wagon driver); inefficient labor because proper motives are not kept foremost. The milk industry is far more complicated than the average manufacturing establishment. The skilled manager finds ample outlet for his every ability. The industry just now is run in the main by the most efficient of those who started with one or two milk routes of their own. These men have done well. Every year has seen new economies. The progress made in the milk industry in the past decade reads like a fairy tale. But there is plenty left for the skilled professional manager to accomplish.

Nor are all the savings in the plant. Good merchandising counts for much. The art of the advertising that pays dividends in the milk business is of

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recent growth. Cordial relations with customers pays in the milk business as in few businesses. In the matter of returning milk bottles alone, good will spells company success. With milk bottles at five cents a piece, there is a snug little profit in just getting consumers in the frame of mind to set out the milk bottles every night. To get thirty trips out of a milk bottle, as can be done when the consumer habitually sets out the bottles, is a profit of one-fifth of a cent per bottle over an average of but twenty trips per bottle, the most that can be secured when the housewife is careless about the bottles.

The loss on milk bottles is one point on which the milk dealer is most often publicly criticized. Consumers cite instances of scores of bottles in their cellars! Or in dump heaps! Or at building operations! There is often a gleeful assumption that the dealer gloats over throwing nickles away in the form of milk bottles. Cannot something be done about it?

Consumers can in numerous ways be taught the monetary value of the milk bottle. Drivers can be paid in proportion to bottles returned. Experience shows, however, that a commission to the driver for return of bottles too large or a standard for returns too strict merely encourages theft. A charge can be made for bottles—if consumers and grocers would only pay for the charge. But neither likes the idea, and the milk dealer soon learns to believe that he alone of all the dealers is keeping the agreement to charge for bottles.

CAN MILK COSTS BE LOWERED

Commercially, the successful way to get bottles back is (1) to build up the housewifely habit of setting the milk bottle out every night; (2) by proper compensation to the driver for collecting his bottles; and (3) an efficient bottle exchange for sorting out mixed lots of bottles. The Baltimore Bottle Exchange handled 1,073,253 bottles in 1916 at a cost of \$0.009877 per bottle. Of this number, 486,000 came from dumps and 588,000 from other dairies. (4) Public health authorities can help by requiring the same name in the bottle as on the cap—thus doing away with the motive for dealers to steal each others bottles. This regulation saved 6000 bottles per week to the bottle buying dairies in one city alone. (5) Magistrates can help by inflicting real penalties on dealers using the bottles and the bottle cases of other dealers. Low fines encourage thefts. (6) Legislators can help by making it an unfair trade practice for one dealer to use the trade-marked bottles of another, and by authorizing the proper authorities to revoke the license of any dealer engaging in such unfair trade practices. (7) The junk dealer should be prohibited from dealing in milk bottles. His trade is too largely with thieves.

Milk distribution costs can be and have been lowered relatively for two main reasons: (1) The business is peculiarly one in which careful management pays; (2) the business is one of decreasing costs: added units of capital and labor bring more than proportional increases in returns.

Unit costs decrease as volume increases.

CHAPTER XII

Public Interest in Milk Distribution

Since milk contains certain elements essential to sound nutrition, not found as cheaply nor as surely in other foods, there is a public interest in milk distribution certainly as great as that in the water supply and exceeding the public interest in gas and electric companies.

Water is a necessity for the preservation of life; milk is necessary for growth in the young and for that sound nutrition prerequisite to a happy and fruitful life. Water may carry disease; so may milk. The cost of the daily supply of water determines sanitary and health standards in the home; the cost of the daily supply of milk determines the physical vigor of childhood, and hence the mental vigor of middle life and the contentment of old age. Gas and electric prices form a small part of the annual outlay of the average family as compared with the outlay for milk. While gas and electricity are aids to public welfare and add to home conveniences, yet neither is essential to a normal physical life as is milk. The discoveries of Dr. McCollum and his contemporaries that milk contains nutrient elements essential to health quite apart from its high food value, lends to those who handle and sell milk a place of vital importance as servants to the physical well-being of their customers and to the

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civic efficiency of their communities. Through these discoveries every milk distributor becomes in fact an all-important public official.

From times immemorial governments have recognized that certain businesses were so essential to public welfare as to warrant a community regulation not customary nor, in these later days of constitutional law, permissible as to private businesses. In feudal days the baker, the smith, the miller had to serve all who came (if they could offer the hire) without discrimination, with adequate service, and with just and reasonable rates. As commerce developed the common carriers were held by the courts to be public callings and to have the same common law duties. We have from century to century changed the lists of businesses that were quasi-public, but the distinctions we have always kept.

At law the quasi-public businesses must serve all who come, without discrimination, with adequate service and at reasonable rates. These are common law obligations and may be enforced in the courts in absence of statutory regulation. And government may for such quasi-public businesses—and does—by statute (or more recently through public service commissions) prescribe reasonable rates, define what constitutes discrimination, set standards for service, and lays down the conditions under which service may be refused. Milk distribution has, up to the present time, been regarded as a private and not as a quasi-public business.

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All business, both public and private, is subject to the state's general police power. The state is, however, limited in its regulation of private business under the police power by specifying what it may not do. In its regulation of quasi-public business it can go farther and provide a fair standard of service, state the conditions under which service may be refused, prevent discrimination in service or in rates, and fix reasonable charges.

May milk distribution in the future be regarded as a quasi-public business? Is the public interest in the product and in the cost of the service such as to put milk in fact among the quasi-public businesses? Is it to the interest of consumers, milk dealers and farmers that this be done?

What is a private business for one generation has been declared to be a quasi-public business for the next. And businesses once quasi-public (such as the miller, the smith and the baker) are now held to be private. Our legislatures may not compel private businesses to serve all who come without discrimination, nor with adequate service, nor can they fix the reasonable price at which private business may sell. But some state legislature passes a law regulating a given business in one or more of these particulars—a business theretofore held to be private—and the courts must determine whether such business has already in fact become quasi-public. If it has, such legislation is valid; if it has not, such legislation is invalid. By what tests does the court give answer to this question?

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The first test is as to whether the commodity or service offered is in fact a natural monopoly.¹ On the feudal estate, the miller, the baker and the smith had to serve all who came, for there was no one else to serve them. Pack trains had to carry the goods offered at the customary rate in early England, because the average merchant could not afford a pack train of sufficient size to be a protection against the robbers that frequented the highways. The ferry had to accept all four of the obligations named above as peculiar to quasi-public businesses at common law, because the sites for ferries were limited by natural barriers and favored by access to highways. Warehouses were proclaimed to be quasi-public, because situated at the very entrance to the gates of commerce. Municipal utilities are quasi-public, because a very limited number of competing companies can find room on the strategic streets and highways. Water and irrigation companies are quasi-public, because of the natural monopoly of sources of water supply. A monopoly or a combination to restrain trade through controlling supply and demand in commodities or services where there is no natural monopoly does not alone make a business quasi-public; such a monopoly is subject to the penalties prescribed at common and statutory law for restraint of trade.

There is no natural monopoly as to the supply of milk. But good sites for milk plants are as limited

¹ Y. B. 39 Hen. VI, 18, pl. 24; Y. B. 10 Hen. VII, 8, pl. 14.

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as are good sites for warehouses. The milk distributing plant must have not only access to the carriers as must warehouses, but milk is perishable and there must be such a location of the plant as to assure wholesome water supply and access to the streets for the retail milk wagons. Therefore, on this test alone milk distribution may be held to be in fact quasi-public. The foregoing pages have shown the economies due to concentration of business. To be sure, mere size of business or proportion of business done by one company are not in themselves final tests as to whether a business is either quasi-public or in restraint of trade. But any business subject to the law of increasing returns, as is the milk business (see Chapter XI), is potentially a monopoly and it is only a question of time until it becomes a monopoly in fact.

The next theory applied by the courts in deciding whether a calling is quasi-public is based on legal privilege. Where a business was created by royal grant¹ or depended upon the exercise of the right of eminent domain there was an obligation to the public and the business was subject to regulation.² Milk distribution has not required the exercise of any exclusive governmental right or privilege, such as the power of eminent domain, and under this theory it cannot be regulated. When milk distribution is declared to be in fact quasi-public, the power of eminent domain would then flow to the business.

¹ 12 East. 527

² 23 Wall. 108; 160 Fed. 856 (1908).

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But natural monopolies and special privileges are not the only tests applied by the courts in determining whether a business is sufficiently freighted with the public interest to be classified as quasi-public. The courts extended the theory of natural and legal monopolies by strained analogies until the decision in the case of *Munn v. Illinois* (94 U. S. 113, 1876). An Illinois statute was sustained fixing the rate of storage of grain in grain elevators. The court followed the principle laid down by Lord Hale "that when private property is affected with a public interest it ceases to be *juris privati* (private right) only." One underlying principle for upholding the fixing of these rates as legal was the virtual monopoly held by the grain elevators from their geographical location. But the court did not rely upon this test. It based its decision entirely upon the existing need in the public interest for such regulation.¹

The control exercised by common law and statute over quasi-public business does not, therefore, necessarily depend upon the presence of a natural, legal or virtual monopoly or geographical location.² The courts further extended the tests in *Brass v. Stoeser* (153 U. S. 391). A North Dakota statute made all buildings, elevators and warehouses, wherever located, used for handling grain for profit, public warehouses, and fixed the rates for storage. The court held the statute constitutional. In this case

¹ This rule was followed in *People v. Budd*, 117 N. Y. 1 (1889).

² 47 Kanb. 1; 41 Fla. 363.

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there was no virtual monopoly arising from geographical site, yet the regulation was held to be valid. The principle was that certain business is so related to the public interest that it becomes subject to regulation. The decision was based entirely upon the public interest in the business. Indeed, the supreme court itself in the later decision, *The German Alliance Insurance Co. v. Kansas* (233, U. S. 398), in discussing *Brass v. Stoeser*, said:

A law of the State of North Dakota was sustained which made all buildings, elevators and warehouses used for the handling of grain for a profit public warehouses, and fixed a storage rate. The case is important. It extended the principle of the other two cases and denuded it of the limiting element which was supposed to beset it—that to justify regulation of a business the business must have a monopolistic character. That distinction was pressed and answered,

Is not the cost of milk distribution equally of public interest? Centralized bottling and pasteurizing plants and lower costs through the elimination of duplication in service are tending, by economic forces, to put but few competing retail wagons on a given street. The service of these wagons and the prices charged are of as much concern to the consumer of milk as are the rates charged for warehouse capacity to the wheat growers.

In *Brass v. Stoeser*¹ the court stated that the public interest in the business makes it subject to regula-

¹ *Op. cit.*

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tion. This principle has been further developed by applying it to the insurance case just discussed.¹ A Kansas statute providing for the regulation of fire insurance rates was upheld as constitutional. The Supreme Court said that such regulation was not a violation of the right of contract guaranteed by the Fourteenth Amendment and did not take property without due process of law. It held that the business of insurance was so affected with a public interest as to justify legislative regulation of its rates.

Are the rates charged by milk distributors of any less importance than the rates charged by fire insurance companies? The milk distributor is no more readily accessible than the fire insurance company, and milk is as essential to the protection of the health as fire insurance is to the protection of property. The court further held in this case that a public interest can exist in a business distinct from a public use of property.

There is another similarity in principle between the price for milk by the large milk distributor and the rates for fire insurance. Said the court:

The price of insurance is not fixed over the counters of the companies by what Adam Smith calls the higgling of the market, but formed in the councils of the underwriters, promulgated in schedules of practically controlling constancy which the applicant for insurance is powerless to oppose and which, therefore, has led to the assertion that

¹ German Alliance Insurance Co. v. Kansas, 233 U. S. 409.

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the business of insurance is of monopolistic character, and that "it is illusory to speak of a liberty of contract." It is in the alternative presented of accepting the rates of the companies or refraining from insurance, business necessity impelling if not compelling it, that we may discover the inducement of the Kansas statute, and the problem presented is whether the legislature could regard it of as much moment to the public that they who seek insurance should no more be constrained by arbitrary terms than they who seek transportation by railroads, steam or street, or by coaches whose itinerary may be only a few city blocks, or who seek the use of grain elevators, or be secured in a night's accomodation at a wayside inn, or in the weight of a five-cent loaf of bread. We do not say this to belittle such rights or to exaggerate the effect of insurance, but to exhibit the principle which exists in all and brings all under the same governmental power.

Business necessity likewise requires identical prices to consumers for similar standards of milk. A profit of one-half a cent per quart is good profit for a company handling a large volume of milk. But from a business point of view it is difficult and costly to collect a half cent even from credit customers. The milk is left at the door step before the customer is up in the morning. The "higgling" of the market is necessarily absent. The customer must rely on the desire of some one competitor to get the trade by cutting prices. This practice results in all cutting to the same level or in the one company driving others out of business. The

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consumer must accept the price as given by the companies or go without milk. And it is not in the interest of the public welfare that this be done without a review in public tribunals as to the fairness of this price.

The courts have answered the querulous objection to these principles to the effect that all business will be regulated if there is any extension of businesses that are quasi-public. These principles are not general and loose, allowing any business to be brought under them. In the dissenting opinion in the German Alliance Insurance Case, Justice Lamar gives the following list of quasi-public occupations:

Canals, waterways and booms; bridges and ferries; wharves, docks, elevators and stockyards; telegraph, telephone, electric, gas and oil lines; turnpikes, railroads, and the various forms of common carriers, including express and cabs. To this should be added the case of the innkeeper (as to which no American case has been found where the constitutional question as to the rights to fix his rates has been considered), the confessedly close case of the irrigation ditches for distributing water (189 U. S. 439), and the toll mill acts.

To this list the court in this case added insurance companies.

An examination of these occupations will indicate that fundamentally the tests are:

The service or commodity is (1) essential to equal access by the public, such as water companies, cabs, inns, transmission of intelligence, insurance, turnpikes; or (2) essential to equal access by private

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businesses in order to keep competition on a practical basis, such as canals, waterways, railways, warehouses, stockyards and irrigation ditches.

These tests the Supreme Court stated as follows in the German Alliance Insurance Case:

We have shown that the business of insurance has very definite characteristics with a reach of influence and consequence beyond and different from that of the ordinary business of the commercial world to pursue which a greater liberty may be asserted. The transactions of the latter are independent and individual, terminating in their effect with the instances. The contracts of insurance may be said to be interdependent. They cannot be regarded singly or isolatedly, and the effect of their relation is to create a fund of assurance and credit, the companies becoming the depositories of the money of the insured, possessing great power thereby and charged with great responsibility. How necessary their solvency is, is manifest. On the other hand to the insured insurance is an asset, a basis of credit. It is practically a necessity to business activity and enterprise. It is, therefore, essentially different from ordinary commercial transactions, and, as we have seen, according to the sense of the world from the earliest times—certainly the sense of the modern world—is of the greatest public concern. It is, therefore, within the principle we have announced.

The common law obligations that attach to every quasi-public business is not only that their charges shall be reasonable, but that they shall serve all who come without discrimination and with adequate

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service. When it is essential to the public welfare that a given service or commodity be thus of equal access to all, the courts declare it to be in fact quasi-public and when the court finds a business to be in fact quasi-public all these duties and obligations attach thereto immediately. It is essential under present-day conditions, for reasons stated in Chapter VI, that milk producers around a given receiving station should all have equal access to that station; and it is essential that consumers should have protection both as to service and as to prices.

The principles themselves also do away with the objection that government cannot wisely fix or control prices. This government can and does do when there is a virtual monopoly in buying, transporting or selling. And such now exists in fact with milk distributing companies; certainly with those in large cities.

If there be doubt as to whether milk distribution is now in fact a quasi-public business there can be no controversy as to what follows such character if it be established.

If milk distribution should be declared a quasi-public business the following are among the elements in a program for public regulation that could be adopted by any state:

1. A state milk commission could be created to regulate individuals and companies engaged in milk distribution to the end that they should serve all who came for reasonable rates, with adequate service and without discrimination.

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2. A consolidation of milk distributing routes and plants could be authorized in order to lower costs, and hence prices to consumers for the same price to the producer.

3. A certificate of public convenience and necessity could be required for any individual or company to enter into the milk distributing business or extend routes beyond the territorial limits occupied on the date the law takes effect in order to protect investments subject to regulation of prices.

4. Grades of milk could be established and enforced for the protection of health and for the assurance of a fair price.

5. Standards of service in the delivery of milk could be enforced to prevent discrimination.

6. Uniform accounting systems could be installed and periodic reports required in order that fair charges for milk distribution could be assured.

7. The commission could be given power to subpoena books, records and witnesses, to examine which it should have the funds necessary for the employment of competent assistance.

8. Milk distributors could be required to take out licenses and the commission empowered to revoke licenses for due cause after due notice and public hearing.

9. Unfair trade practice such as doing business with the milk cans belonging to farmers or the cans or bottles of other dealers could be prevented.

The advantages to the consumer of such a program would be: unnecessary duplication of investment

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and of service would be eliminated and milk distribution costs could be lowered accordingly; all the economies listed in the preceding chapter resulting from zoning milk routes would be available to lower distributing costs; the wholesomeness of the milk supply could be more surely guarded at minimum costs; fair standards of service and proper grades of raw and pasteurized milk could be assured.

The advantages to the milk distributor would be: investments would be protected in fact and in law; a fair return on the fair value of the property would be assured. Whether the "fair value" and the "rate of return" allowed by the commission would be as large as the capitalization and return thereon possible without regulation is a question in the minds of many milk dealers. But certainly the tests applied as to what constitute fair values and a fair return are such as are fair to a conservative judiciary, and in the long run must be comparable to results under real competition; for capital must not only be kept in the business but attracted to it. And if there is no real competition it is high time regulation be provided in the public interest.

To the producer the advantages would be: (1) Access through public officials to all the facts as to receiving station and distributing costs of the milk distributor to whom his milk is sold in order to assure a fair judgment as to what costs should be deducted from the consumer's price for these services. The price to the farmer is the price to the consumer less these costs and hence the farmers'

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market is widened as the costs between him and the consumer are lowered. (2) The increase in the consumption of whole milk, due to the satisfaction that tends to follow public assurance that a price is fair, will tend to react favorably on the price of milk going into manufactured products. (3) These results will be secured in large part if only there be assurance that these costs are fair even though they are not lowered. For public confidence is an asset of first importance to every business that needs a widening market.

By no test can milk production be legally regarded as quasi-public business and hence prices to producers can not constitutionally be "fixed" by statute nor by commission. Provision can be made for the arbitration of such prices. The only compulsion, however, can be publicity. The providing of such machinery has created public confidence and thus bettered and extended the market for both dealer and farmer while assuring a fair price to the consumer. Where collective bargaining is in force such arbitration machinery is advisable.

Certainly the law and the facts warrant this conclusion: *There will be in time a sustained demand for public regulation of the charges and services of milk distributing companies that will find fruition in law unless milk distributors place and keep their businesses on a high ethical plane, with a high regard for the public interest in fair charges for their services.* In more than one state such laws have already been submitted to the legislators. If milk dealers will

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keep their relations to the public on a high ethical plane, refrain from taking all the traffic will bear just because they may be in a position to get it, prefer conservative annual profits and returns to exorbitant profits and over-capitalizations, the day of regulation of milk distribution in the public interest may never come. But if this business becomes one in which professional promoters exploit consumers for personal profits and greed is unrestrained public regulation is both inevitable and advisable. The author should say that he finds a high regard for the public interest to be innate in the rank and file of milk distributors. This attitude of fairness to the public is native just because the demand for milk is so sensitive to the attitude of mind of the consumer. Good will is the best asset of the milk distributor.

There are certain policies which milk distributors can adopt voluntarily that will go far toward securing to all parties at interest some of the advantages flowing from that concentration of business essential to minimum costs, with a fair regard to the public interest. These are:

1. To so locate and maintain receiving stations as to get and keep a quantity of milk sufficient to assure minimum costs. Unnecessary duplication of investment is as inadvisable in the country as in the city. The volume will also depend upon the roads and hauling distance of producers.

2. To raise the standard of competition on the street by agreeing as to a minimum amount of milk

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to be carried on any retail wagon and as an average on all retail wagons. This will put competition on a paying basis, give to all a share in the economies of larger loads and shorter hauls, and hence lower the cost of distribution.

3. By coöperation and consolidation to scrap receiving stations with capacity too low or with equipment too antiquated for economical operation, and to get the volume in well-located modern plants sufficient to assure minimum costs with fair consideration of the convenience of producers.

4. To do away through bottle exchanges with many unfair trade practices such as doing business with the cans, bottles, cases or other property of farmers or dealers. Such coöperation must be aided by proper ordinances or statutes affixing penalties for the larceny of such properties.

5. To keep the retail wagon the main agency for distributing milk.

6. To maintain faithfully high sanitary standards.

7. To keep the business on a sound investment basis, shorn of speculation.

8. To accept the principle of conservative, because assured, profits.

Under competition the savings on such policies will in part at least be shared with the producer or consumer or both.

The public is interested and will ever vigorously interest itself in the policies of milk distributors and in the costs of milk distribution.

PART III

Fair Price Policies

CHAPTER XIII

The Food Value of Wholesome Milk

Not so many years ago the relative values of foods were determined so far as they were determined scientifically by chemical analysis. Protein, energy value and digestability were assumed to be the sole tests of the value of a food. As fats, mineral salts, proteins and carbohydrates were the essential constituents of the normal diet, the nutrition expert rested his investigations with an analysis of the relative proportion and character of these elements in the respective foods.

The facts thus discovered were and are of inestimable value. But it remained for a new school of research students, of which Professor E. V. McCollum of Johns Hopkins may be called the dean, to find out, through experimental methods that there are certain other elements essential to sound nutrition, not found in all foods, but found only in milk and leafy vegetables, but most surely and abundantly in milk.

Just what these substances are is not known. Funk¹ suggested that they be called vitamins. But inasmuch as in organic chemistry the words ending in "amine" apply only to subjects containing nitrogen, this word is not applicable to the substances in question. It is certain that at least the substance

¹ Funk, C. J., *State Med.*, 1912, **xx**, 341.

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found in butter does not contain nitrogen. Messrs. McCollum and Kennedy¹ have proposed that these elements be referred to as "Fat-soluble A" and "Water-soluble B."

Fat-soluble A prevents the development of a pathological condition of the eyes. Water-soluble B prevents the development of beri-beri, a fatal form of paralysis prevalent among rice-eating peoples. Moreover, Professor McCollum points out that "what we designate by each of these terms is in reality but a single physiologically indispensable substance, and not a group of substances."²

It is not possible to secure appreciable growth in young animals fed exclusively as the sole source of nutriment upon seed products, such as wheat, corn, rice, rolled oats, rye, barley, kaffir corn, millet seed, flax seed, pea and both the navy and soy bean.³ A cow, for instance, will not thrive on corn alone, but it will thrive, give an abundance of milk and produce vigorous offspring, on a food mixture consisting of all the parts of the corn plant, including the leaf and the straw as well as the seed. It has not been possible to prepare a ration that will induce good nutrition in animals solely from wheat products. The potato is to be classed with the seeds in its dietary properties, especially when pared in the

¹ Jour. Biol. Chem., 1916, XXIV, 431.

² McCollum, E. V., "The Newer Knowledge of Nutrition" MacMillan, 1919, p. 32. This is by all odds the best book on the subject. This book and "The American Home Diet" by E. V. McCollum and Nina Simmonds, 1920, should be in every public library.

³ *Ibid.*, p. 38.

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ordinary way. In the cellular layer just underneath the thin paper-like skin of the potato is relatively more of the fat-soluble A. The roots which we use as foods contain this substance but not in the degree which milk does. The dietary properties of meats are comparable with the seed foods rather than with the leafy foods. . . . With the exception of milk, the foods of animal origin do not supplement completely the dietary deficiencies of the seeds and their products.¹

Says Professor McCollum:¹

(1) Seed mixtures, no matter how complex or from what seeds they are derived will never induce optimum nutrition.

Seeds with tubers, or seeds with tubers, roots and meat (muscle), will in all cases fail to even approximate the optimum in the nutrition of an animal during growth.

(2) The only successful combinations of natural foods or milled products for the nutrition of an animal are:

(a) Combinations of seeds, or other milled products, tubers and roots, either singly or collectively taken with sufficient amounts of the leaves of plants.

(b) Combinations of the food stuffs enumerated under (a) taken along with a sufficient amount of milk to make good their deficiencies.

Milk and the leaves of plants are to be regarded as protective foods and should never be omitted from the diet. Milk is a better protective food

¹ *Ibid.*, p. 81.

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than are the leaves when used in appropriate amounts.

Again he says:

It is unwise to approach very closely the physiological minimum with respect to any dietary factor. Liberal consumption of all of the essential constituents of a normal diet, prompt digestion and absorption and prompt evacuation of the undigested residue from the intestine before extensive absorption of products of bacterial decomposition of proteins can take place, are the optimum conditions for the maintenance of vigor and the characteristics of youth. Such a dietary régime can be attained only by supplementing the seed products, tubers, roots and meat, which must constitute the bulk of the diet of man, with the protective foods—milk and the leafy vegetables.¹

The Professor's conclusions as to the value of milk as a protective food compared with the leafy vegetables are:

Milk is, however, without doubt, our most important foodstuff. This is true, because the composition of milk is such that when used in combination with other foodstuffs of either animal or vegetable origin, it corrects their dietary deficiencies. Combinations of equal weights of milk and one of the cereal grains give excellent results in the nutrition of animals during growth, and grain mixtures supplemented with milk support well in adult life the function of reproduction and rearing of young. This is because of the excellent quality of its proteins, the peculiar composition of its

¹ *Ibid.*, p. 148.

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inorganic content and the remarkable content of the dietary essential, fat-soluble A, in the fats of milk. Milk, like nearly all of the other natural foods, contains a great abundance of the second dietary essential of unknown chemical nature, water-soluble B.

The conclusions from the above are that milk is so constituted as to be priceless as a supplementary food to make good the deficiencies of the tubers, seeds, and muscle meats. The only other foods which can more or less take its place are eggs, the leaves of plants and the glandular organs, such as liver. In price these special nutrient elements are found most cheaply and most abundantly in milk. Yet milk also compares well with other foods in price for its protein and energy content. By these tests, milk, while not the cheapest, is one of the cheapest and is the most needed of all foods.

Dr. Dorothy R. Mendenhall, in a bulletin in the *Care of Children Series*¹ issued by the United States Department of Labor, declares milk to be the indispensable food. She says:

Milk is often stated to be a perfect food. By this we mean that it contains all the essential elements for normal human growth and development.

The adequacy of a food or diet depends briefly on its containing:

1. Enough of the right sort of material to build up and repair the living tissues of the body. These body-building substances in the food are called proteins, and are found especially in milk, meat,

¹ No. 4. United States Department of Labor, 1918.

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fish, eggs, and in certain vegetables, especially beans and peas.

2. Enough substances to furnish the required energy of the body. Fats, starches and sugars are the chief energy foods, and are transformed in the body into energy for work and into body heat.

3. A variety of mineral substances, which are needed in the growth and functioning of the parts of the body, such as the skeleton, the brain, the blood, etc.

4. An adequate amount of certain substances whose nature is not yet fully known but whose presence in the diet has been demonstrated to affect body growth in animals or man. These substances, known as vitamins, growth determinants, or the unknown dietary factors, are therefore essential elements in our food.

5. No substance poisonous to the average individual nor one which will not allow of normal digestive processes.

In addition, to be properly digested and of the utmost nutritive value, articles of diet must also be of pleasing taste, palatable and preferably of a consistency and appearance similar to the foods in customary use by the race.

Clean milk fulfils all of these requirements for an adequate food better than any other single foodstuff.

Milk is, then, in a sense, a complete food; if used as the sole food it will sustain life and allow growth. It is used as an exclusive diet for young children, but after infancy supplementary foods need to be included in the diet for the best development. For one reason, milk—which, in respect to all its ingredients, ranks among the most digestible of animal foods—is so completely digested that

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there is practically no waste. Though this complete digestibility renders milk one of the most efficient foodstuffs, a certain amount of non-digestible material in the food—so-called roughage—is necessary to regulate the discharges from the digestive tract. For this reason, and for several others, a mixed diet after the first year of life is better than an exclusive milk diet.

Unfortunately cows' milk is low in iron content, even as compared with human milk, and this important mineral must be supplied in other foods. The prolonged exclusive use of milk after early infancy tends to produce an anemia from lack of iron in the blood. Iron can best be introduced into the diet through the early use of fruit, vegetables, and whole cereals.

The abundance, character and digestibility of its proteins and its large mineral content make milk, as we have shown, a most desirable food; but, after all, the most valuable properties of milk lie in its containing an abundance of the unknown dietary factors—the vitamins which control growth and health. One such substance is found chiefly in milk fat and the organic fat of certain other animals, but is not present in vegetable oils or in pork fat. Eggs and green vegetables, such as spinach and chard, do contain appreciable amounts of this vitamin, but milk is our chief source. The cream of a quart of milk contains as much of this vital substance as is found in all the skim milk left after the cream is removed. A second recognized vitamin is present in all foods consumed in their natural state and in sufficient abundance to maintain health. In the manufacturing of purified foodstuffs, such as the polishing of rice or in the milling of flour, this substance may be lost, and a

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diet made up entirely of denatured foods may cause disease or even death, due to a deficiency in this essential substance.

A food like milk which, given in moderate amounts, combines enough of *both* of these vitamins to allow of normal growth and development, has a value in the human dietary greater than that of any other single food.

It is true that appetite in many cases has to be considered, and an exclusive diet of any single food substance becomes distasteful to the large majority of us and tends to lower digestive processes and to cause impaired nutrition. However, this does not mean that the child should be allowed to refuse milk as a substantial part of his daily diet, if the diet includes, as it should, several other forms of food. All normal children are better for at least $1\frac{1}{2}$ pints of milk a day.

The average chemical composition of milk is:

	Per cent.
Water.....	87.1
Total solids.....	12.9
Fat.....	3.9
Casein.....	2.5
Albumin.....	.7
Sugar.....	5.1
Ash.....	.7

The variation in chemical content is given in the footnote.¹

¹ From a chemical standpoint milk is a very complex substance. The component parts may, however, be classified into a few well-marked groups as follows: (1) Water, (2) fat, (3) nitrogenous constituents, (4) sugar, and (5) ash. The components other than water are collectively known as total solids or milk solids and the solids other than fat as solids not fat. Milk serum, or more properly milk plasma is the term used to denote the milk minus the fat; hence the terms serum solids and plasma solids are synonymous with solids not fat.

Water: The water in milk varies from 82 to 90 per cent. The usual variation in mixed-herd milk is much less and is probably covered by 84 to 88 per cent.

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Numerous have been the nutrition experts that have made special researches as to the food value of milk when compared with other foods. All of these are in substantial agreement. The author chooses the tables that follow made by Dr. Flora Rose because they are so clear cut and concise in statement.¹ The prices used are pre-war prices. But these can readily be translated into the prices of the day.

Fat: The fat in milk—milk fat or butter fat—is not in solution but exists as an emulsion of microscopic globules so small that a single drop of average milk contains more than one hundred millions of them. These globules, even in milk from one cow, are not all of the same size. Some may be two or three times the size of others, the average size depending upon several factors, the principal one of which is the breed of the animal. Chemically the fat is not a single compound but a mixture of several compounds known as glycerids. Some of the glycerids are common to all fats, while others are peculiar to butter. This fact is made use of in detecting oleomargarin.

Cow's milk usually contains from 3 to 6 per cent of fat, depending very largely upon the breed of the animal.

Nitrogenous constituents: These are principally casein and albumin, the traces of less important nitrogenous compounds. The coagulum, or curd, produced when rennet, dilute acids, or certain other chemicals are added to milk is chiefly casein. Albumin is the flaky precipitate produced by heating whey or skimmed milk from which the casein has been removed. The constitution and behavior of it closely resembles white of egg. Casein is not really in solution in the milk, but exists in an extremely fine colloidal condition in combination with some of the ash constituents. With an appropriate filter of clay it is possible to separate it from the water. Albumin is in true solution in the water of the milk. Frequently, but improperly, the term casein is applied to all the nitrogenous constituents in milk. Sometimes the term total proteins is used in referring to the nitrogenous constituents taken as a whole. The amount of casein in average cow's milk varies from 2 to 4 per cent and the albumin from 0.5 to 0.8 per cent.

Sugar: Milk sugar, or lactose, belongs to a group known as carbohydrates and is a white substance less sweet in taste than cane sugar. Milk sugar is broken up into lactic acid by the action of bacteria, this bringing about the souring of milk. Milk sugar is in solution in the water of milk and is present to the extent of from 3.5 to 6 per cent.

Ash: The ash, or the mineral part of milk exists to the amount of about 0.75 per cent and consists largely of the chlorids and phosphates of sodium, potassium, magnesium, and calcium.

¹ Cornell Reading Course, III. January, 1917.

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Ten cents will buy the following amounts of energy in a few typical foods:

	Calories.
In milk at 10 cents a quart.	672.5
In milk at 8 cents a quart.	840.1
In round steak at 26 cents a pound.	271.0
In eggs at 35 cents a dozen.	234.0
In eggs at 55 cents a dozen.	153.0
In bread at 6 cents a loaf.	1,713.5
In oatmeal at 5 cents a pound.	3,601.5
In cornmeal at 4 cents a pound.	4,037.0

While milk is not at the head of this list, it stands well as compared with meat and eggs. The milk fat and milk sugar in addition to being sources of energy, perform certain other functions as well. In the milk fat is the fat-soluble A, the essential food protective element discussed above. The sugar in milk is not the cane or beet sugar of commerce, but lactose, a sugar peculiar to animals. Milk sugar is but faintly sweet. It is an essential to growth—while the sugar that pleases the “sweet tooth” is not. Milk sugar is believed to be important in holding in check putrefactive changes in the contents of the large intestine and thus performing the beneficial effects supposed to come from buttermilk and other sour milks.¹

In protein ten cents will buy:

	Grams of Protein.
In milk at 8 cents a quart.	40.00
In milk at 10 cents a quart.	32.00
In cheese at 25 cents a pound.	52.26

¹ Cf. Rettger, L. F., Jour. Exper. Med., 21; 4; 365-388, 1915.

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	Grams of Protein.
In round steak at 26 cents a pound.....	37.14
In eggs at 35 cents a dozen.....	20.60
In eggs at 55 cents a dozen.....	13.85
In dried lima beans at 10 cents a pound.....	82.10
In white bread at 6 cents a loaf.....	61.50
In cornmeal at 4 cents a pound.....	104.30
In oatmeal at 5 cents a pound.....	151.30

In discussing the protein in milk Miss Rose says:

These figures without adequate explanation indicate that milk is not a very cheap source of protein. This criticism of the cost of protein in milk would be convincing if it were not for certain facts recently made clear about protein. Protein is a name given to a group of substances differing rather widely in their value to the body. Two foods may contain the same amount of protein; but an ounce of the protein from the first food may be much more valuable in building and repairing tissue than an ounce of the protein from the second food.

Exact data making it possible to say that this or that protein is twice or three times as valuable as another protein are scarce, but some comparative figures on the value of various proteins in animal feeding are available, which will illustrate the point sufficiently well to clear up the record of milk as a cheap source of protein. McCollum (1916) gives the following table to show what percentage of various proteins eaten by pigs is used for building tissue:

	Percentage.
Oil meal proteins.....	16-17
Wheat proteins.....	20
Corn proteins.....	24
Oat proteins.....	25

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	Percentage.
Wheat germ proteins.	40
Casein of milk.	45
Skim milk proteins.	63

Hart and Humphrey (1915), as a result of experiments to determine what foods are best for the growing animal and for milk production, state that milk proteins have an efficiency for milk production and tissue restoration of 60 per cent as compared with an efficiency of 40 per cent for corn proteins and 36 per cent for wheat proteins.

Milk of all the common foods is the richest in available lime. Ten cents will buy the following amounts of lime in common foods.

	Grams of Lime.
In milk at 8 cents a quart.	2.045
In milk at 10 cents a quart.	1.636
In milk at 15 cents a quart.	1.090
In milk at 20 cents a quart. ....	.810
In cheese at 25 cents a pound.	1.990
In eggs at 35 cents a dozen. ....	.149
In eggs at 55 cents a dozen. ....	.096
In round steak at 26 cents a pound. ....	.019
In dried lima beans at 10 cents a pound. ....	.450
In white bread at 6 cents a loaf. ....	.198
In whole wheat bread at 12 cents a loaf. ....	.226
In cornmeal at 4 cents a pound. ....	.170
In oatmeal at 5 cents a pound.	1.179

Milk is also rich in phosphorus as well as in lime and is a cheap source for this valuable food element. While low in iron content, the amount of lime increases the ability of the body to use iron. These minerals are essential food products.

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Milk is a complete food containing all the elements necessary to nutrition and growth.

Butter, because it contains the fat-soluble A, has a food value not found in important quantities in oleomargarin or other substitutes for butter. In the margarin that contains no milk fat or beef fat, both the fat-soluble A and the water-soluble B are wanting. In the beef margarins that contain some beef fat, the fat-soluble A is present, but not so plentifully as in butter fat. Butter is not the only source of the fat-soluble A, but it is an important source. Says Professor McCollum on this point:

If the diet contains a liberal amount of milk, eggs, glandular organs or the leaves of plants, it will, if otherwise satisfactorily constituted, prevent the onset of the eye disease. The seeds and seed products, such as wheat flour (bolted), degerminated cornmeal, polished rice, starch, the sugars, syrups, tubers, roots, such as the radish, beet, carrot, turnip, etc., and also the muscle tissue of animals, such as ham, steak, chops, etc., do not contain enough of the fat-soluble A to be classed as important sources of this dietary essential. The tubers and roots appear to be somewhat richer in it than are the seeds. In the form in which they are ordinarily eaten as mashed or baked potato, baked sweet potato, fresh or creamed radish, cooked carrots, beets or creamed turnips, the water content of the dish as served is so high that the amount of solids eaten is not a very high percentage of the total food supply, and the protective action is correspondingly limited. In

Op. cit., p. 89.

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America, however, potatoes are seldom eaten without the addition of butter. The vegetable fats and oils, such as olive, cottonseed oil, peanut and coconut oils, although good energy yielding foods, do not furnish this dietary essential. The body fats of animals such as lard, beef fat, etc., are not important sources of the fat-soluble A.

This growth-producing fat-soluble A does not deteriorate when the butter is held in storage¹ nor when it is heated with live steam for two and one-half hours,² which is higher temperature and more prolonged period of heating than the milk fat is subjected to during the process of manufacture into butter.³

Milk, therefore, compares well with other foods in its chemical food value content, but it must be repeated that the chemical test is not the sole test as to the nutrient properties of foods. To quote once more from the authority in these matters, Professor McCollum:

It is fallacious reasoning to attempt to compare the money value of certain foods with certain others. We may safely compare the cost of the cereal grains or the legumes with each other, or with the tubers such as the potato or the sweet potato or with the root foods. It is not possible to compare the cost of any of these with milk or the leafy vegetables, such as cabbage, cauliflower, Swiss chard, collards, Brussel sprouts, onions,

¹ Osborne, T. B., and Middel, L. B., "The Stability of the Growth-Promoting Substance in Butter Fat," *The Jour. Chem.*, Vol. 24, No. 1, p. 38, 1915.

² Osborne, T. B., and Middel, L. B., "Further Observations of the Influence of Natural Fats upon Growth," *The Jour. Biol. Chem.*, Vol. 20, pp. 37 and 384, 1915.

³ Guthrie, "The Book of Butter," p. 17.

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lettuce, celery tops, spinach, turnip tops and other leaves employed as greens. Milk and the leafy vegetables are to be regarded as protective foods. In some degree eggs are to be considered in the same class. Milk and the leafy vegetables should be taken in liberal amounts. The leaves should not be regarded as foods of low value because their content of protein, fat and carbohydrate is low and the content of water high. When compared on the basis of chemical composition they appear inferior to seeds, but they have a peculiar value in their high content of fat-soluble A and of mineral elements, which makes them stand in a class by themselves among the vegetable food-stuffs.¹

In the report to Food Administrator Hoover the Milk Committee² summed up the actual food value of milk in feeding the family as follows:

1. Milk is the ideal food for infants.
2. Milk is the best single kind of food for the proper development of growing children.
3. Milk is necessary in any family dietary that is based on the welfare of adults.
4. Milk has these values to the health and development of the family because it meets the nutritive needs of the human body.

For a given amount of money, milk will furnish a higher percentage of available building materials

¹ *Op. cit.*, p. 141, 142. "No thorough studies of the dietary property of fruits," says Professor McCollum, "have yet been made, but from their known chemical composition and biological functions as storage organs, their proper place in the diet can be predicted. They are good sources of mineral salts and of energy-yielding food, the sugars. They are highly palatable and exert a favorable influence on the excretory processes of the kidneys and the intestine. Their liberal use in the diet should be encouraged."

² For names of this committee see page 109.

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than almost any other food. Milk is one of the most important sources of the factors in foods that are essential to growth, health and body regulatory functions.

That pasteurization does not destroy the food value of milk has been shown in Chapter IX.

The best present-day knowledge as to the food value of milk powders and of condensed milk as compared with fresh whole milk was expressed in the following resolution adopted at the annual meeting of the National Commission on Milk Standards in Chicago on December 8, 1918:

The use of powdered whole milk, skim milk powder, condensed or evaporated whole milk or skim milk, butter fat or other fats and water and of machines for combining, mixing or emulsifying these materials for the production of manufactured milk or cream was considered by a special committee including some of the food chemists of the commission. Their special report on these subjects was adopted by the commission and was as follows:

1. Since the application of the term "synthetic" to mixtures such as those under consideration is not entirely consistent with the accepted scientific use of the term and is likely to cause confusion, we recommend that the use of the term "synthetic" be discouraged and that the commission recommend the terms "recombined milk," "reconstituted milk," on the labels of products made entirely from milk constituents, and "artificial milk" or "milk substitute" on the labels of products in which any other fat is substituted in whole or in part for milk fat.

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2. The committee moves the adoption of the following resolution:

"WHEREAS, Recent investigations in the science of nutrition have fully demonstrated the unique value of milk as a food and the intimate relation between adequate milk consumption and the support of normal growth or maintenance of health and vigor; be it

Resolved, That the commission urge upon all concerned with the production and distribution of milk, whether as producers, dealers or public health and food control officials, the great importance of bringing into human consumption the largest possible proportion of all wholesome milk products, and to this end recommends that the sale of such products as recombined milk should not be hampered by any restrictions beyond those absolutely necessary for the prevention of fraud and the protection of health."

3. In the case of recombined milk made exclusively from cream or butter and milk or skim milk, fresh, condensed or dried, the materials having always been maintained in sound condition and not subjected to unnecessary heating, the interests of the consumer in our opinion demand nothing further than that the product as delivered to the purchaser shall meet all the requirements as to cleanliness, bacterial count and chemical composition of fresh milk of the same grade or class and shall be labeled in a manner that will correctly indicate its true character.

All grades of milk up to 18 per cent cream are now successfully dried. The composition¹ of several of these dried products follows:

¹ Stocking, Wm. A., "Manual of Milk Products," 1917, MacMillan Company.

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	Butter Fat (per cent).	Casein (per cent).	Albumin (per cent).	Milk Sugar (per cent).	Ash (per cent).	Moisture (per cent).
Skim milk.....	1.35	29.79	7.91	49.94	8.21	2.40
Half skim.....	14.20	25.56	6.70	44.41	7.01	2.12
15 per cent cream.....	65.15	10.60	2.82	17.86	2.91	0.66
18 per cent cream.....	70.47	9.08	2.42	15.01	2.46	0.56

Buttermilk also can be powdered. Professor Stocking gives the composition of dried buttermilk as follows:

	Per cent.
Butter fat.....	8.0
Protein.....	34.0
Milk sugar.....	40.0
Lactic acid.....	6.0
Moisture.....	9.5
Ash.....	2.5

100.0

These powdered or dried milk products will keep many months with no increase in the bacterial count.

There are available annually in this country about 15,000,000 pounds of skim milk. Too much of this has gone to waste. This waste can be prevented by drying or condensing skim milk and by using it in the home in a liquid state or as cheese. The comparative value of skim milk and whole milk are:

<i>Skim Milk</i>	<i>Whole Milk</i>
90.5 per cent water	87.0 per cent water
0.3 per cent unavailable nutrients	0.5 per cent unavailable nutrients
3.3 per cent protein	3.2 per cent protein
0.3 per cent fat	3.8 per cent fat
5.1 per cent carbohydrates	5.0 per cent carbohydrates
0.5 per cent ash	0.5 per cent ash

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One pint of skim milk furnishes 170 calories; one pint of whole milk furnishes 310 calories.

Skim milk is essentially liquid lean meat. Five pints of separator skim milk contains chemically the same food value as one pound of meat. Roughly speaking, meat and cottage cheese are of equal food value, pound for pound. On the average, 15 pounds of cottage cheese, can be made from 100 pounds of skim milk. Cottage cheese is composed of about 72 per cent water, 20 per cent protein, 1 per cent fat, 4.3 per cent carbohydrates and 1.8 per cent ash.

The food value of milk is thus summarized by Dr. McCollum:

It is a fact too well known to need comment, that milk is a complete food for a young, growing animal and that for a certain period after birth, a period which varies with the species, no other food can take its place without disaster. It is not so well known that milk is a food of exceptional value for the adult, although a few medical men have fully appreciated this fact. Dr. Wier Mitchell many years ago had remarkable success in the treatment of patients suffering from neurasthenia, by keeping them in bed confined to a diet which was principally milk. It is of unusual interest to note that Harvey, the discoverer of the circulation of the blood, in reporting on his autopsy of Thomas Parr, who is stated to have lived to the age of 153 years, says that his diet until just before his death when he was invited to the court of King Charles in 1635 consisted of subrancid cheese, and milk in every form, coarse bread and small drink, generally sour whey. . . . Milk is therefore so constituted as to make an ideal food for supplementing the ordinary vegetable foods which should form a considerable part of our diet.

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It corrects the deficiencies of these in a remarkable way. In order to obtain best results, however, it is best to use with the ordinary vegetable foods, but a small amount of meat, a quart of milk a day for each member of the family, and as much of one or another of the green leafy vegetables as the appetite will permit.¹

¹ McCollum, E. V. and Simmons, Nina. "The American Home Diet," Frederick C. Mathews Co., 1920, p. 69.

CHAPTER XIV

Coöperation and Price

One of the theories of our industrial life has been that competition assured a fair price to producer and to consumer. According to this theory price was the result of forces beyond control and hence the wisest policy was to let those forces alone and accept as the gift of the gods whatever price they brought. To this "law of supply and demand" we were to abdicate the throne of reason and social control. In this view, price was to be accepted without protest as cows in pasture take the rain: content with the downpours that fatten and, shivering, submit in silence to the long cold drizzles that kill.

But price is not necessarily the result of iron laws that bind the hands of endeavor and stifle the voice of social need. Prices are man-made. They may have in them the sentiment of good will, the desire to do well, the sense of obligations to others, the ethical and living standards of those who buy and sell. Being man-made, prices are subject to human control and are in large part what we desire them to be, if we have but the vision, the skill, the persistency of endeavor and the good will that brings the coöperation essential to sound price adjustments.

A few crowded years ago, because of rising feed and labor costs, farmers had to get a higher price

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for their milk to get back costs of production. One way to secure an advance in price is to let milk get so scarce that the short supply will force up the price, leaving each farmer to sell at what he can get and to stop production when he must. This method is effective. Effective because it bankrupts some dairymen who hope too long; effective because it slaughters cows, leaves dairy barns to rot, and destroys the fertility of the fields; effective because it disgusts whole districts with dairy production, and turns their energies to other products of the farm; effective because it costs so heavily to the next generation of children whose milk must be higher priced in order to entice back the confidence of dairy districts, reclaim the farms, rebuild the barns, grow cows from calves and replace bankruptcy with prosperity. Such is the law of supply and demand when unguided by the torch of vision in the hand of coöperative helpfulness.

There is another method for raising up the price of milk to the point where production will be maintained or increased to meet growing needs. This method starts with a meeting of milk producers who see the need for a higher price. Their decision is not to kill their herds, but to get others to believe in their needs and, believing, help. The first step is to get a thorough organization among milk producers so that they may bargain as one man with the one milk dealer to whom they sell. This one dealer sees the need for getting others to join with him. Perchance, being human, his first effort is

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to get others to join with him to prevent the payment of a higher price, or at least to make certain that others pay as high a price as he does. The coöperation of other dealers to this end means only that the milk producers in their districts must also organize to assure equality of bargaining power.

Dealers organized and producers organized agree on prices that affect the consumer. Consumers complain much, suffer long and patiently, then a few consumers get together to "see what can be done about it." At first, being human also, they decide to boycott milk and bring the "producer-distributor milk trust" to terms. In this they are aided by reporters who write stories that say what consumers want to hear. Some city attorney with the political itch puts the farmers who are trying to preserve their properties in jail for conspiracy to restrain trade.

But in time wiser counsels prevail. Organized consumers, organized dealers and organized farmers get together. Each group states their needs and all learn that by coöperation each group can get justice in price. The demand for milk is widened because consumers learn the true food value of the milk they buy. The representatives of consumers find that the price they thought was too much was still less than the milk is actually worth in money. They plead, however, that milk is a necessity for all children and the price should therefore be based, not on all that the traffic will bear, but on a program of efficient production on the farm, with the least

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possible costs in distribution. The farmers reply that their interest is in the annual net return, and that they are ready to accept somewhat lower prices in the autumn if the organized consumers will coöperate to increase consumption in the spring months when production costs are as high as in the autumn but when milk production is higher only because cows are fresh. Consumers point out that drivers of retail wagons are careless in collecting bottles and that there are too many retail wagons on each street. The dealers reply that they can lower the costs of distributing if consumers will take pains to put their bottles out each morning, report the names of drivers who are careless in collecting bottles, and see to it that bottles are not used for preserves or carelessly broken in the home. The dealers also indicate their willingness to reduce the number of wagons on each street by agreeing to a minimum load on each wagon and a minimum average load for all wagons. Costs are lowered in the country by the coöperation of organized farmers and organized dealers to prevent unnecessary duplication in country receiving stations; and the coöperation of transportation companies is assured to get proper and adequate facilities for shipping milk to the city. With these assurances the farmers' organization urge their members to cool their milk properly because so to do widens their market through a more wholesome product and gives to the organized consumers a product they can push more vigorously.

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In planning their spring campaign for increased milk consumption the organized consumers elicit the coöperation of teachers in the schools in teaching the food value of milk and in distributing leaflets giving recipes for the use of milk. The officials of charity organizations agree to bring these recipes and the facts as to the food value of milk to the attention of those whom they visit. Knowing the facts and the needs, the physicians also agree to help in this campaign. The bulletins published by various governmental agencies are ransacked for information to be used. For it avails nothing that the scientists know the facts about the food value of milk unless the mother in every home knows and acts on these facts. Moving pictures are enlisted, posters in the street cars and on the retail wagons tell the value of milk as compared in prices with other foods. Health officials join lustily in the movement, knowing its value to public health and welfare.

As the season of maximum production approaches, it may be found that the prices for butter, cheese and condensed milk are too low to safeguard production. The coöperation of the federal authorities is sought to relieve or encourage the export situation. To obtain and maintain a good export trade standards are necessary and the aid of the national bureau of markets with the coöperation of state market bureaus is enlisted to assure standards in production, manufacture, package, storage and transportation that will give us an entrance into inter-

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national markets. Prices to farmers soon reflect this new confidence in future prices for milk products.

And what are the achievements of these coöperative methods? Through stabilized prices the net return to the producer for the year is such as to keep the output of milk up to the larger amount needed; the price to the consumer of whole milk is stabilized on a year round basis so that the price for milk in the autumn months when it is most needed by consumers because of the scarcity of green vegetables will not be unreasonably above the price in the summer when such vegetables are plentiful; to this same end it is agreed that the spread to the milk dealer from f. o. b. city to the consumer shall be wider in the spring and summer in order that it may be smaller in the autumn months and thus further aid to stabilize the price to consumers; the price to the consumer reflects the savings in economical milk distribution in that avoidable duplication of investments and of wagons on the street is done away with; the investments of milk dealers are safeguarded so that the return need not include an added risk due to discontent as to milk prices in the country or in the city. All parties are financially better off. And that because they understand each other. And all have learned that the law of supply and demand can be brought to reflect social needs and fair prices.

But this is all a dream you say? Quite to the contrary these are the methods that have been used and the results that have been secured in Philadel-

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phia, Pittsburgh, Baltimore, Detroit and other cities in the United States.

And all this without the use of power? Not at all. All of this just because of the effective mobilization of power. Producers, organized, can effectively refuse to sell. Consumers, organized, can effectively refuse to buy. Dealers, organized, can effectively refuse to buy and to sell. Neither, unorganized, can do this. Nor can either group get its best results until both the other groups are thoroughly organized. Useless one without the other. For one, alone, can be unfair; and unfair prices in time bring their own penalties.

The night of the day of individual effort unaided by coöperation is over. The dawn of the new day of enlightened coöperation is at hand; a coöperation that is enlightened because it is powerful enough to get a full hearing and a full hearing begets justice.

But does this not mean economic strife? Progress comes through the struggle of equals. It is bushwhacking, not fair price bargaining, for organized dealers to say to individual farmers what price they are to get for milk, or for organized farmers to name a price to individual dealers or for organized farmers and organized dealers to set prices to be paid by individual consumers. Price conferences should include all three elements through representatives with a power sufficiently organized to get fair treatment.

The agents of government when thus supported can be effective whether as mediators or in aiding

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marketing or in the protection of health and public welfare. Government officials need not then assume burdens they cannot carry. Only organized producers and organized consumers are effective with any governmental organization under the large industrial units of the day. In coöperation is power. Our forefathers put this another way: "In union there is strength." Through coöperation with power, prices can be made just and kept so.

The elements in coöperation of the kind characterized above have been exemplified for a considerable period in Philadelphia, Pittsburgh and Baltimore. The results have been: a price to producers equal to and at times above that in other primary districts; a lower relative cost of distribution; a price to consumers below that prevailing in nearby cities where farmers have received a lower price; a wholesome stabilized market for both producers and dealers.¹ The plans differ slightly in each of these cities, though their essentials are the same. It will suffice for the plans in all three cities to give here the important elements in the Pittsburgh Plan.

The Pittsburgh Plan

When the Food Administration was demobilized and its arbitral work came to an end the representatives of the two farmers' organizations centering in Philadelphia and in Pittsburgh joined with representative consumers and milk dealers in asking the

¹ See especially chart on page 156.

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Governor of Pennsylvania to appoint a milk price arbitrator to arbitrate price differences between producers, dealers and consumers. The organized farmers did not believe that their power to strike should be uncontrolled nor did the dealers believe that their power to refuse to buy should be exercised save in the long-time public interest; and both felt that the public should be party to prices so pertinent to human welfare as are milk prices. This principle is the fundamental one in the Pittsburgh Plan as it is in Philadelphia and Baltimore.

This arbitrator meets with the monthly price conference presided over by the county agent.¹ In attendance also are about a half dozen women representing the Congress of Women's Clubs of Western Pennsylvania, the Catholic Women's League, the Housekeepers' League, the Public Health Nursing Association, the Consumers' League, and the Milk and Ice Fund. These conferences are open to the public. The reporters for the newspapers are invited and attend. An accountant named by the arbitrator goes over the books of the milk dealers and presents his findings to the arbitrator. These findings for the market as a whole are given in general to the conference. The arbitrator never gives out facts as to any one milk distributor. Reports are at hand from a county agent² who has continuous information as to production costs in the district. The dealers and producers give their facts

¹ Mr. N. S. Grubbs of Allegheny County, Pa.

² Mr. J. M. McKee of Washington County, Pa.

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as to costs and market conditions and present their price arguments in open meeting. Conference committees may be appointed. The representatives of the public aid in any and all ways pertinent to the welfare of producers, distributors or consumers. Prices thus agreed on are respected by all the purchasers in the district. The State Agricultural College, the Pittsburgh Chamber of Commerce both have joined in this coöperative effort.

Representatives of producers, and the public dealers have been and are willing to hear "the other side." All parties have accepted heartily the principle of arbitration and have recognized in spirit and in letter the interest which each of the other groups has in the price for milk.

The spirit of the Pittsburgh plan was expressed by the following resolutions adopted by the congress of Women's Clubs of Western Pennsylvania on November 29, 1919:

Whereas, The farmers producing milk for the Pittsburgh district have in their price conferences considered the interests of the consumer; and

Whereas, The milk dealers in Pittsburgh are taking substantial losses during the month of December in order that the price to the consumer may not be advanced over the November prices; and

Whereas, The producers and milk dealers include a committee of consumers in their price conferences and accept the principle of arbitration as to prices to be paid by producers and consumers; therefore, be it

COÖPERATION AND PRICE

Resolved, That we, the Congress of Women's Clubs for Western Pennsylvania, endorse the principles and methods used in these milk price conferences and recommend to all business and to all laborers the advisability of accepting similar principles at this time and including the interest of consumers in setting prices and fixing wages.

This is not an arbitral court. The arbitrator has only publicity powers. The plan simply represents the elements essential to fair prices in the milk industry under twentieth century conditions. It is the new way of giving achievement opportunities to that race-old economic principle: "The Lord helps them that help themselves." The heart of the plan is collective bargaining in the public presence in the best interests of all, with no one party at interest an autocratic power. It is a way truly American. It gets results.

CHAPTER XV

Fair Price Policies

Policies adopted by the public as well as policies adopted by milk producers, manufacturers and distributors will largely determine the fairness of the price of milk both to producers and to consumers. Let us therefore restate in conclusion those policies reflected through these pages that, adopted, will tend most surely to protect the long term interests of all.

Those policies only will persist that are based on the facts of the industry. Of these facts the following are of outstanding importance in shaping policies:

(1) Whole milk is a perishable article, for which a market must be found every day whether it be manufactured into products, the price for which is determined by national and international forces, or whether it be sold as whole milk.

(2) The wholesomeness of milk is paramount to its food value.

(3) Other factors being equal, the unit cost of distributing milk decreases as volume increases.

(4) Milk contains certain properties essential to sound nutrition.

These are not new facts, but they are the outstanding facts around which policies that stay must be built.

Whole milk is perishable. Just because whole

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milk is a perishable product the price of milk to the farmer and to the consumer must be determined by market conditions; that is, by the quantity producers are making and consumers are eating. When prices of whole milk are materially above the price of manufactured milk products, any increase in normal production unaccompanied by a similar increase in consumption, soon means heavy financial losses to the dealer.

With uniform employment at rising wages, a much larger quantity of milk can be sold at higher prices than under conditions of unemployment. Weather conditions peculiar to a primary market will materially affect either the production or consumption of milk; usually decreasing the one while increasing the other, seldom decreasing or increasing both in the same ratio.

Within any given primary market region the price on whole milk must be uniform in order to keep the flow of milk into usual marketing channels. But as between the larger primary raw milk markets there must be monthly variations in price to meet changing local producing and consuming needs.

Just as certainly as the conditions of production and consumption in each primary market largely determine the price of whole milk when that price is materially beyond the value of manufactured milk products, so the value of these manufactured products must largely determine the price of whole milk when substantially more milk is being produced than is being consumed. In both periods, of course,

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there must be a price to the farmer that will give him his production costs as judged by his alternatives; and over a period of years, the production costs and consumption figures must be the same; but it is the way of all markets that these two forces for any one day or for any one month or for any one year are seldom identical.

The first plank in fair price policies is that the price of milk to the producer is determined by market conditions. And this for the very simple reason that the alternatives lie with the farmer on the one hand and with the consumer on the other. The farmer can produce, the consumer can eat, more or less of other things. And this "more-or-less" factor it is that in the final analysis determines the price of milk.

The question with the farmer is not only what he is making on milk but whether he can make more or less on milk than on other things; the question with the consumer is whether she desires to choose more or less milk at prevailing prices as compared with other foods.

We may reach to the average adult that milk is worth 20 cents a quart in food value, but those who are not in the toothless age will respond to instinct more powerful than preachments and demand something to chew. A long line of chewing ancestors sets the upward limit to the amount of fluid milk adults will consume, even though it is the one perfect food. And the wise old farmers that make the choice as to whether they will or will not produce

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milk cogitate on many things not included in price formulas.

The law of supply and demand is not a juggernaut car before which all must cast themselves. Both production and consumption are the results of a complexity of forces, all of which are subject to social control within limits by proper means. We can, by coöperative action, adopt constructive policies that will protect the interests of both producers and consumers of milk. Communities, local or national, can have ideals and carry them out just as do individuals.

That governmental agencies can ever "fix" the price to be paid producers for milk is one of the ideas that ought to be interned for all time to come. Governmental agencies can really "fix" prices only where production and consumption are both known and subject to complete control. This happens only when, as in war time, government becomes the chief purchaser, or when there is a monopoly of purchasing or of production, or, as with electric, water, or street railway companies, of distribution. The spread that is required for distributing milk, public agencies may determine; that is, where the distributing agencies are few or can all be put under the same control, just as gas and electric and other public utilities have.

But price fixing can never be effective as to the price the farmer must take for his milk. For over the farmer's choice no one can have control. Even as to the distributor's spread governmental powers

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have their distinct limits in that the alternatives as to where and how men use their capital and their abilities rest with the individuals. In this field, therefore, governmental price fixing to be permanent or economical must be such as to entice capital and adequately reward individual merit.

As to milk prices to the farmers, all parties at interest can help to assure a price that will maintain a production adequate to consumption needs.

Many methods can be used to broaden the market for milk so as to maintain a price that stimulates production. To this end

(1) Policies that favor the development of an export trade in dairy products should be adopted and maintained. This emphasizes good grades and proper packing

(2) The facts as to the food value of milk as compared with other foods should be disseminated by teachers, by consumers' clubs, by physicians and by public officials.

(3) Conditions under which milk is produced, shipped or distributed we should continue to improve, in order that the quality of milk delivered to the consumer may be such as to keep milk both a tasty and wholesome food.

(4) The nutrient element in butter, not found as a rule in substitutes for butter, should be made known to each household in all countries.

(5) Milk producers should organize to protect their price and further economies in production and transportation. To this end collective bargaining

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by milk producers should not be prohibited by anti-trust statutes. This done the principle of arbitration must be recognized.

(6) Prices to consumers can be stabilized by coöperation between producers and distributors to the end that the habit of milk consumption may grow to the betterment of the health of the consumer, the market for the producer and the business of the milk dealer. Price stabilization, however, does not mean price uniformity the year round to either producer or consumer.

Other factors being equal, the cost of distributing milk per quart decreases as volume increases. Volume, to be sure, is not the sole determining factor in distributing costs. Many concerns of small volume will have lower costs than concerns with larger volume. But, assuming equal competency in management, equal ability in getting efficient work from laborers, and assuming that equipment and buildings are used to capacity, the larger the volume of milk going through the plant and the larger the volume of milk on the retail wagon, the lower the cost per quart.

To increase the spread is to increase the number of channels through which milk is profitably distributed; and it is only by decreasing those channels that investments can be assured of protection, and total net profits increased.

It is sound policy, therefore, to encourage volume in plant and on retail wagons. This volume can be encouraged and maintained by the following principles:

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(1) The retail wagon alone is the economical method of distributing milk.

(2) Cash and carry plans must be eliminated.

(3) Grocery stores should carry milk as an accommodation and prices should reflect this.

(4) Unnecessary duplication of investment both in city and in country is not to the interest of farmers, consumers, milk dealers, or health authorities.

(5) The ideal is one retail milk wagon only on each street.

(6) This retail wagon should deliver milk in sealed containers, kept from the first under controlled and refrigerated conditions.

One plan often advocated as a proper solution for the milk problem misses all the essential points, and that is the plan of having a public pasteurizing plant, under the theory that any small dealer can get his milk pasteurized at the same cost as the large dealer, and thus assure low prices through competition.

Is each dealer to have his own bottles under this plan? If so, is the dealer with the smaller number of bottles to pay more per unit than the dealer with a larger number of bottles? The cost will be more. Is bottling to be done separately in many places where there can be no adequate inspection? Is there to be a higher price to the consumer for those dealers who have to make the longer hauls? Is there any assurance under this plan that many competitors will either protect the purity of the milk or the price?

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The new scientific fact that there are elements in milk absolutely essential to sound nutrition, quite apart from its chemical food value, makes milk distribution a public service, and of every milk distributor a public servant. This fact, together with the other human elements in milk distribution, emphasizes another plank in sound public policies: the salient facts as to milk distribution should be available to all; facts as to health, facts as to investments, facts as to production and distribution costs. Herein lies protection to investments, freedom from criticism of the uninformed, a stable market, a satisfied clientele.

Just how this should and will be done will vary from section to section. It augurs well for the future that milk dealers themselves have been the first to desire just such publicity. The promoter is an unwelcome visitor to the average milk dealer, for the milk dealer, as no one else, knows that there is something peculiarly repugnant to the public mind in having "water" in the stock of milk companies. Therefore, the milk dealer has everything to gain and nothing to lose by factual publicity.

Milk distribution is essentially a quasi-public business. The law and the facts indicate that it will be made so unless milk distributors keep their business on a high plane of price justice.

American consumers are fair and cordially lend their good will where facts show their treatment to be fair. The dealer under full publicity can expect that the public will be fair with him.

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The wholesomeness of milk is paramount to its food value. The wholesomeness of the milk supply is best assured through bacterial, sediment and butter fat tests of the product as delivered, rather than through reliance primarily on inspection of dairy herds and barns. This places a larger responsibility on the milk dealer. A sufficient number of inspectors should be provided to aid farmers and dealers in producing milk that is wholesome and in keeping it so.

Milk varies in value as much as does wheat or corn or apples or other commodities for which grades have been established by law. The value of milk is dependent upon butter fat content and on purity. It should be bought and sold, therefore, on a butter fat basis. The grading of the milk purchased from the producer is done when it is bought on a butter fat basis. Grades of milk, including a grade of standardized milk, should be legally established for sale to the consumer.

In short, those policies are sound that assure a fair bargain as to price; secure a milk produced and distributed under guidance of inspectors to insure its purity; cooled promptly on the farm to insure wholesomeness; handled through machinery that can be sterilized that the milk may not be contaminated; distributed with the least possible duplication of labor and investment, with a volume in receiving station, in plant and on the retail wagon requisite for minimum costs; all with full publicity of cost and profit facts.

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